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C O N T E N T

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ORGANISATIONAL SUPPORT AND COMMITMENT ON EMPLOYEES' JOB SATISFACTION OF FORESTRY RESEARCH INSTITUTE OF NIGERIA

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Abstract

Organisational support and commitment amongst factors have enhanced job satisfaction of employees in organisations. This study studied the effect of organisational support and commitment on employees' job satisfaction of the Forestry Research Institute of Nigeria. A two-stage sampling procedure was used to select 260 employees in the study organisation. Primary data were obtained on organisational support and commitment as well as the job satisfaction of employees through the use of a structured questionnaire. Descriptive statistics, mean score and regression analysis were used for data analysis. Results showed that the levels of organisational support ($\bar{x}$ = 4.6), commitment ($\bar{x}$ = 4.5) and employees' job satisfaction ($\bar{x}$ = 5.1) was fair. Linear Regression further showed that organisational support (β=0.398), affective (β=0.108) and continuance (β=0.12) organisational commitment significantly increased job satisfaction (R^2=0.204; p<0.01). The study concluded that organisational support and commitment are important contributors in determining employees' job satisfaction in the study organisation. It was recommended that the studied organisation should develop a responsive, blueprint and normative administrative assertion management approaches through corporate trainings, collective organisational capacity building programmes, well established organisational feedback mechanisms and systematic organisational appraisal in the organisation towards ensuring a better job satisfaction of its employees.

Key words**:** *employees, organisation, support, commitment, job satisfaction*

INTRODUCTION

The sensation and opinion of the employee about the state to which their involvement is appreciated and recognized by their institution as well as how it attends to their wellbeing is termed organisational support [18] and this has developed much concern for quite some period [6]. Similarly, it is the workers' point of view vis-à-vis the notch to which the establishment is apprehensive for their well-being bearing in mind its hard work for it [32]. Employees put more vigor when there is a indication that all efforts will be held and be rewarded by the institution. In this sense, the work tactics and behavior of employees are much affected by various laid down policies and programs which in the end leads to useful organisational results [33]. Through this, employees rely on that the organisation contemplates through their effort in the achievement of organisational goals. Therefore, employees always involve themselves in undertakings which keep them close, giving them reverence from their employer and this leads the organisation to success [1]. In other words, organisational support is of ostensible importance for employees and considered by them as a critical issue which improves their job satisfaction and organisational commitment [11].

According to [27], they described organisational commitment as the receipt, consciousness and admiration of the controlling canons with the goals and objectives of the organisation and the readiness to work with higher assignation with organisational affiliation. These are measured as the critical modules of corporate obligation. This is recognized as an inspiring upshot of supervisory purposes and features [35] affirming a promise concerning the organisation and the employee [34].

Notably, many researchers' established that to determine job satisfaction, remuneration guidelines, working settings and administrative surroundings are main and significant contributors [7; 8; 9; 10; 21 and 22]. These structures are believed to be interlaced even though satisfaction with one feature does not ratify the fulfilment with all the other aspects. They proposed that through the relationship with persons, for example, their close managers and supervisors in relation with the working environment, employees' can institute the level of contentment amongst them and this could increase the chances of remaining with the organisation [30].

Nonetheless, a better relationship with supervisors are linked with the specific job satisfaction which has an nonstop bearing over employee set on to stay with or quit. Each time an employee feels discontent with his/her job, then there are extreme likelihoods of that employee to quit or leave [1 and 29].

It is however of note that organisational activities can impact significantly on job satisfaction, organisational support and commitment in the organisation. In many developing countries, particularly in Sub-Saharan Africa, this information is often lacked, making planning a challenging workout and task. There is a dearth of information at present on organisational activities of the Forestry Research Institute of Nigeria since the beginning, which has made operational design a tough duty and driver mediations unsuccessful. It is however of importance to carryout a study of this nature if the improvement and the objectives of the organisation are to be attained.

The following specific objectives were considered to achieve the broad objective of the study which examined the effect of organisational support and commitment on employees' job satisfaction at Forestry Research Institute of Nigeria. These specific objectives are to:

(i)examine the levels of Forestry Research Institute of Nigeria employees organisational support, commitment and job satisfaction;

(ii)determine the effect of organisational support and organisational commitment on the Forestry Research Institute of Nigeria employees' job satisfaction.

The ensuing hypotheses were verified in the alternate form.

H_{01}:Organisational support significantly influences Forestry Research Institute of Nigeria employees' job satisfaction.

H_{02}:Organisational commitment significantly influences Forestry Research Institute of Nigeria employees' job satisfaction.

MATERIALS AND METHODS

Cross-sectional primary data was collected at the Forestry Research Institute of Nigeria using the structured questionnaire with closed and open-ended questions. Five work locations out of fifteen work locations were selected using simple random sampling after which stratified sampling procedure was used in selecting employees by their position (management, senior and junior) from the list of employees provided which served as the sample frame. A set of 226 questionnaire were retrieved out of a set of 260 questionnaire administered (constituting about 13% of the sample frame and about 87% of the sample size). These retrieved set of questionnaire was further used in the later investigation.

This research intrument used statements adopted from previous studies. Respondents were asked to specify on a 7-point Likert-type scale the magnitude to which they agreed with the comments. A few statements were negatively worded and later reverse-scored to check response bias. 7-item organisational support scale was used to measure organisational support. This was adapted from the scale of [13]. 31-item organisational commitment scale was used to measure organisational commitment. This was adapted from the Organisational Commitment Questionnaire (OCQ) [3 and 17]. 14-item job satisfaction scale was used to measure job satisfaction. This was adapted from the study of [5 and 16]. Mean score and regression analysis were further used to analyse the data collected.

The linear regression equation is as shown below:

Model 1

$Y = a+\beta_1A+\beta_2B+\mu$ ...eq. 1

Model 2

$Y = a+\beta_1A+\beta_2C+\beta_3D+\beta_4E+\mu$ ...eq. 2

where:

Y = Job Satisfaction
A = Organisational Support
B = Organisational Commitment
C = Affective Organisational Commitment
D = Continuance Organisational Commitment
E = Normative Organisational Commitment
β = Coefficient (i = 1,2,3…..,n)
a = Constant
μ = Error term

RESULTS AND DISCUSSIONS

On the basis of the methodology presented above, the levels of respondents' organisational support, commitment and job satisfaction is as presented in Table 1 below. The result from the table showed that level of employees' agreement is very important in the administrative decision in addition to in the mechanism of organisational support, commitment and job satisfaction of employees.

Table 1. Employees' levels of organisational support, commitment and job satisfaction

Variable		Mean	Level of Agreement
Organisational Support		4.6	Somewhat Agree
Organisational Commitment	Affective Commitment $\bar{x}$ = 4.7	4.5	Somewhat Agree
	Continuance Commitment $\bar{x}$= 4.7		
	Normative Commitment $\bar{x}$ = 4.5		
Job Satisfaction	Intrinsic (Motivator Factor) $\bar{x}$ = 5.2	5.1	Somewhat Agree
	Extrinsic (Hygiene Factor) $\bar{x}$ = 5.1		

Source: Field Survey, 2018.

From the reslts of the table above, the organisational support was $\bar{x}$ = 4.6. This implied that the organisation as contributed and cared about employees well-being and aspirations. This result was supported by the findings of [12 and 14]. The organisational commitment was $\bar{x}$ = 4.5. This implied that employees are devoted and dedicated to their organisation. This result is sustained by the findings of [31]. The organisational affective commitment was $\bar{x}$ = 4.7. This implied that strong positive emotional ties are created as the employee develop with the organisation primarily through positive work experiences. This outcome is consistent with the findings of [26]. The organisational continuance commitment was $\bar{x}$ = 4.7. This finding is buttressed by [28]. The organisational normative commitment was $\bar{x}$ = 4.5. This finding is constant with the discoveries of [4; 23 and 25]. However, the employees' intrinsic job satisfaction was $\bar{x}$ = 5.2 while the employees' extrinsic job satisfaction was $\bar{x}$ = 5.1. In all, the employee job satisfaction was $\bar{x}$ = 5.1. This implied that employees' have a resilient optimistic emotional reactions to their job [1].

Effect of organisational support and commitment on employees' job satisfaction

The linear equations presented below explained the regression results of the influence of organisational support and organisational commitment on employees' job satisfaction.

Model 1

$Y=3.004^{***}+0.418A^{***}+0.043B+\mu$

R-Square value = 0.176; F value = 23.742^{***}

Note: $^{***}= (\alpha_{0.01})$; $^{**}= (\alpha_{0.05})$; $^{*}= (\alpha_{0.01})$;

The result of Model 1 revealed that there was a significant effect of organisational support on job satisfaction. The equation showed that the organisational support coefficient value was 0.418. The implication of this is that for every additional one percent in organisational support, it is expected that job satisfaction of employees would increase by an average of 41.8%. A related finding was supported by the results of previous studies which had shown that organisational support was significantly and positively connected with levels of job satisfaction. Also, a high status of organisational support gave rise to a greater level of job satisfaction [2].

Furthermore, Model 2 consisted of the organisational support and the three-domains of commitment developed by [24] which suggested that organisational commitment is experienced by the employee as three simultaneous convictions including affective, normative and continuance organisational commitment. The linear combination of these

four independent variables was related to the job satisfaction which is the dependent variable. The regression result is presented beneath:

Model 2

$Y=2.384^{***}+0.398A^{***}+0.108C^{*}+0.120D^{**}-0.038E+\mu$

R Square value = 0.204; F value = 14.15^{***}

Note: $^{***}=(\alpha_{0.01})$; $^{**}=(\alpha_{0.05})$; $^{*}=(\alpha_{0.01})$.

The result of Model 2 showed that organisational support, affective and continuance organisational commitment had a significant effect on job satisfaction. The equation showed that the coefficient of organisational support is 0.398. The inference of this is that for every additional one percent in organisational support, it is expected that employees' job satisfaction would increase by an average of 39.8%. This agrees with [33]. However, the coefficient of organisational support is 0.108. This implied that for every added one percent in affective organisational commitment, it is expected that employees' job satisfaction would increase by an average of 10.8%.

These outcomes are in line with findings reported by [1] that job satisfaction related most strongly to affective commitment. The findings is also attributed to the notion that each job satisfaction associated emotional commitment relate to an individual's approach towards their work.

Furthermore, the coefficient for continuance organisational commitment is 0.12 which implied that employees' job satisfaction would predictably increase by an average of 12% for every additional one percent of continuance organisational commitment.

A comparable result is supported by fallouts of [19 and 20] which stated that increased job satisfaction related intensely to better continuance commitment.

In the effort of predicting the human behaviour in organisations, the R-Square values of the models were found to be lesser than 50%. The reason is because individuals are essentially changeable than machines [15].

CONCLUSIONS

This study had added to research by understanding the effect of organisational support and commitment on employees' job satisfaction in a well-structured organisation. From the result of the investigation, the discoveries delivered the experiential aid that organisational support, affective and continuance organisational commitment would significantly influence job satisfaction positvely. This have thus paid to report the organisational support and commitment sway on job satisfaction of employees in a characterized institution. Besides, this indication will be of distinct help in the workers package mediation schemes and its execution in the studied organisation.

Centered on the answers of this study, the resulting recommendations were made to ensure an improved and enhanced job satisfaction of employees in the organisation.

(i)For the reason that employees play a vital role in the continuous quality improvement of a structure, the organisation should understand the different dynamics that will positively increase its employees' job satisfaction. Through well established organisational feedback mechanisms, this could be achieved.

(ii)The organisation should from time to time evaluate its organisational policies. This will also assist the organisation in enhancing its employees' job satisfaction. This might be attained through a systematic organisational appraisal.

(iii)The organisation should carry out fair policies in resource allocation (such as salaries, promotions, punishments, rewards and fringe benefits), decision making and the settings of organisational support among its employees.

(iv)The organisation should develop an responsive, blueprint and normative administrative assertion management approaches which are basics for forecasting imperative employees' outcomes such as job satisfaction. This could be accomplished through collective organisational capacity building programmes.

(v)The relationship between the managers, supervisors and their subordinates in the organisation should be improved upon as this will boost the commitment of the organisation towards its employees thereby increasing their job satisfaction. This could be realized

through corporate training programmes in the organisation.

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GUESTS' PERCEPTION, EXPERIENCE AND SATISFACTION OF WAITING FOR HOTEL SERVICES IN ADO-EKITI, NIGERIA

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Abstract

The purpose of this study is to examine and determine the hotel guests' perception, experience and satisfaction of waiting for service. This study proposes that there is a significant effect of guests' perception and experience on their satisfaction of waiting for hotel services. For this purpose, a detailed literature review was examined. Furthermore, 245 questionnaire was applied to 7 hotels guests above the age of 18 in Ado-Ekiti, Nigeria through a simple random sample selection technique to test their perception, experience and satisfaction of waiting for hotel services scales. Variables related to the survey participants and their relation to each other were tested by linear regression analysis and it was understood that there was a significant relationship between these factors. According to the result of linear regression analysis, it was observed that there was a significant positive relationship between guests' satisfaction vis-à-vis their perception (β=0.677) and experience (β=0.253) of waiting for service.

Key words**:** *guests, perception, experience, satisfaction, hotel services*

INTRODUCTION

An annoying experience for many guests is waiting for a service which may negatively affect the guests' perceptions about that service provider [12]. Nonetheless, once the guests experience such long waiting for the service, their perceptions about that experience with the provider might be affected due to the quality of waiting and service [3]. By these facts, the effect makes the service provider lose both guests and revenue.

However, [1] stated that many businesses assumed that enhancing customers' experiences will reflect positively on the status of the hotels by focusing more directly on creating enjoyable staying experience for guests. This, therefore, sets in increasing competition among hotels seeking to attract new guests as permanent customers. Besides, an essential factor that controls the success of these hospitality businesses is the quality of guests' experiences during inevitable waiting times which could also be a major disadvantage. The price is indefinite when customers lose trust in a hospitality provider. A long waiting time influences customers' satisfaction with the service provider, and thus give customers a negative experience.

Conversely, the waiting experience could be positive when managed well [4] through demand shifting which could be achieved by customers wait for an activity but not wait in line. Through this, guests can enjoy other activities and then come back to the reserved activity at a specific time to enter. On the other hand, guest satisfaction is significant for a positive service assessment. When customers are happy, the service quality will be highly rated. However, [12] believed that when guests feel they wait for too long for a service, the overall service quality will be considered/rated less than satisfactory. Even if the service quality is impressive, a long wait will affect the final outcome of the experience.

Therefore, enhancing the guest experience is the main challenge for many businesses. In the hospitality industry, businesses seek to enhance guests' experiences through the variety of services offered such as personalizing and customizing. Still, those services are time-dependent.

When guests are not served in an acceptable amount of time, the evaluation of the experience could be negatively influenced and

directly affecting guests' satisfaction. However, many studies suggested that controlling guests' perceptions can alleviate the negative impact of the service delay. Inducing guests' perceptions about the service provider might influence the wait positively [7]. Likewise, waiting during the experience could be positive or negative, thus, understanding guests' perceptions are critical in creating an unforgettable experience.

Guest satisfaction is a major concern for service providers and waiting for service might decrease guest satisfaction about their experience [11]. Service promises might be broken when guests reserve a time and then have to wait [8]. Therefore, many service providers attempt to fill guests' waiting times with activities to make their waiting times enjoyable. Studies revealed that occupied time increases positive wait assessments and reduces perceived boredom. Guests who are joining an activity during the wait experience tend to be more satisfied and less bored [9]. Though, [2] and [11] stated that commonly offered activities might be boring or routine for guests. [5] conducted a study about the waiting experience which they attempted to link the actual length of waiting and guests' time styles (general attitude toward time) to the way they experience the waiting time. When waiting times become longer, guests become passively impatient and less satisfied as they observe the service. Even if the service were perfect, they might not observe that because of the long waiting. Therefore, the duration of wait plays an important role in determining the quality of service [1].

The general objective of the study is to examine the effect of hotel guests' perception, experience and satisfaction of waiting for service in Ado-Ekiti, Ekiti State, Nigeria.

In order to achieve the general objective, the following specific objectives would be considered: To

(i)profile the personal characteristics of hotel guests' in Ado-Ekiti, Ekiti State, Nigeria.

(ii)examine hotel guests' perception, experience and satisfaction of waiting for service.

(iii)determine the effect of hotel guests' perception, experience and satisfaction of waiting for service.

Based on the objectives of the study, the following hypotheses were tested;

H_{01}: There is a significant effect of guests' perception on their satisfaction of waiting for hotel services.

H_{02}: There is a significant effect of hotel guests' experience on their satisfaction of waiting for hotel services.

MATERIALS AND METHODS

Study area

The study took place in Ado-Ekiti, the capital city of Ekiti State. The city is located within the North Western part of the Benin-Owena River Basin development Area. The population of the region was put at 245,661 with a density of 310 persons per square kilometers [10]. Ado-Ekiti, an ancient city in Nigeria is located between latitudes 7º34′ and 7º41′ North of the Equator and Longitudes 5º 11′ and 5º 61′ East of the Greenwich Meridian, the history of Ado-Ekiti dates back to a period before the advent of Ewi dynasty in 1310 AD. It grew to a town of repute about 700 years ago when the 'Oba Ado' otherwise called the 'Elewi' joined the princely adventure instituted by several children of Oduduwa (from Ile-Ife) to find their own territories [6]. It became the headquarters of the Ekiti Divisional Council in 1916 and rose to the status of a state capital on October 1, 1996. It has a total population of 157,519 people going by the 1991 population census, and 308,656 people, according to the 2006 Housing and population census. With the upsurge in the urbanization trend in the region, the estimated population of the city could be put around 600,000 people.

Geologically, Ado-Ekiti lies entirely within the pre-Cambrian Basement Complex rock group, which underlies much of Nigeria. It falls within Koppen's 'A' climatic belt that is the tropical wet climate. The city is strategically located in Ekiti land at the convergence of major roads forming a radial pattern.

Educationally, Ado-Ekiti is at the forefront. It has about 14 public secondary schools and 4 notable tertiary institutions which are located in the city to give qualitative education to the people.

Economically, Ado-Ekiti is undergoing a tremendous transformation. The commercial banks located in the city boost commercial activities. Hotels and Rest Houses are located strategically in the city which offers recreation and tourism opportunities to people. As a result of economic, social and political transformation that is taking place in Ado-Ekiti in recent times, the city continues to witness physical expansion in terms of buildings, transportation network (roads) duplication of market places, social activities, religious activities and economic activities. The transportation system of the city is operating at a below average level.

Sampling and Data Collection

The guest sample was selected in seven (7) hotels within Ado-Ekiti. The reason for choosing a wide range of hotels in different destinations was to achieve a reliable and valid research sample of guests whose responses represent an overall picture of perception, experience and satisfaction of waiting for hotel services in the study area. The sample consisted of hotels guests, both male and female, above the age of 18. A total of 245 self-administered questionnaire were distributed to guests who lodged in the hotels. This was collected immediately after completion. The sample size was limited to a quota of 35 respondents per hotel. Through a simple random sample selection technique, each hotel guest had an equal chance of being selected for an interview.

Questionnaire Development and Measures

The questions were mainly prepared on 3 scales. These are hotel guests' perception, experience and satisfaction of waiting for service. For that reason, to start with, 5 questions were included in the questionnaire to determine the demographic profile of respondents. Demographic information was sought through close-ended questions. Hotel guests' perception, experience and satisfaction of waiting for service scales were measured through an eighteen (18) items respectively on a 5-point Likert ranging from 'strongly disagree = 1' to 'strongly agree = 5'. However, based on [1], these items were further analyzed and then categorised into four types of data: room division (front desk office and lodging/accommodation), food and beverage (breakfast, lunch and dinner), general services (parking facility, laundry room decor, security and gym facility/health care services) and other services (WiFi/Internet, location, newspaper, TV channels, outdoor sitting and communication skills of workers).

Data Analysis

The data was analysed using the IBM Statistical Package for Social Sciences version 23. In the data, there were no missing values detected and observed that variables were not distributed normally. Thus, the linear regression analysis determined the relationship between a dependent variable and a group of independent variables. It estimates the coefficients of the linear equation, involving one or more independent variables that best predict the value of the dependent variable. The importance of regression analysis to this study is to predict the hotel guests' satisfaction of waiting for hotel service using their experience and perception of waiting for hotel service. The linear regression equation is represented in the explicit form thus:

$$Y = a + b_1X_1 + b_2X_2 + e \quad \text{...Eq. 1}$$

where:

Y = Guests' satisfaction of waiting for hotel service

X_1 = Guests' perception of waiting for hotel service

X_2 = Guests' experience of waiting for hotel service

b_i = Coefficient

a = Constant

e = Error term or stochastic disturbance.

RESULTS AND DISCUSSIONS

Demographics of the respondents

Table 1 examined the demographics of the respondents. It was observed that the majority

(68.98%) were males while the females constituted 31.02%, although most of the respondents were married (62.04%). However, 85.31% of the respondents were between the ages of 18-45. When the educational status of the respondents is considered, it has been observed that 59.18% of the respondents was graduated from Polytechnic/University. In terms of the purpose of visiting of respondents in the study area, it was observed that majority of the respondents were on tour (33.47%), holiday (23.67%) and business (21.22%).

Table 1. Demographics of the respondents

	Variable	Frequency	Percentage
Age (Years)	18 – 25	58	23.67
	26 – 35	79	32.24
	36 – 45	72	29.39
	≥ 46	36	14.69
Sex	Male	169	68.98
	Female	76	31.02
Marital Status	Not Married	152	62.04
	Married	93	37.96
Education	Secondary School	10	4.08
	National Diploma	54	22.04
	Higher National Diploma	71	28.98
	University Degree	74	30.20
	Post Graduate	36	14.69
Purpose of Visiting	Holiday	58	23.67
	Conference	37	15.10
	Business	52	21.22
	Family and Friends	16	6.53
	Tour group	82	33.47

Spurce: Field Survey, 2018.

Perception, experience and satisfaction of respondents waiting for hotel services

Table 2 presents the perception, experience and satisfaction of respondents waiting for hotel services.

The respondents have high perception of workers communication skills (M=4.72), location (M=4.18), laundry room décor (M=4.16), television channels (M=4.04) and gym facility/health care services (M=4.01). The respondents have a high experience of lunch (M=4.5), television channels (M=4.33), location (M=4.3), gym facility/health care services (M=4.24), laundry room décor (M=4.17) and outdoor sitting (M=4.16). However, newspaper (M=4.92), front desk office (M=4.9), breakfast (M=4.69), gym facility/health care services (M=4.67) and parking facility (M=4.66).

Table 2. Perception, experience and satisfaction of respondents waiting for hotel services.

Hotel services	Perception	Experience	Satisfaction
Front desk office	3.86	3.91	4.90
Lodging/ Accommodation	3.26	4.11	4.15
Breakfast	3.60	3.70	4.69
Lunch	2.92	4.50	4.17
Dinner	2.47	3.63	4.42
Parking facility	3.68	3.68	4.66
Laundry room décor	4.16	4.17	4.09
Security	3.10	3.43	4.41
Gym facility/Health care services	4.01	4.24	4.67
Wifi/Internet	3.84	4.03	4.16
Location	4.18	4.30	4.53
Newspaper	3.21	3.77	4.92
Television channels	4.04	4.33	4.43
Outdoor sitting	3.27	4.16	4.50
Workers Communication skills	4.72	3.87	4.55

Source: Field Survey, 2018.

Perception, experience and satisfaction of respondents waiting for categories hotel services.

Table 3 presents the perception, experience and satisfaction of respondents waiting for categories hotel services.

The respondents have a higher perception (M=3.88) and experience (M=4.08) of other services such as WiFi/Internet, location, newspaper, TV channels, outdoor sitting and communication skills of workers while having a higher experience of food and beverage (M=4.52) such as breakfast, lunch and dinner.

Table 3. Perception, experience and satisfaction of respondents waiting for categories hotel services.

Hotel Services Categories	Perception	Experience	Satisfaction
Food and Beverage	3.56	4.01	4.52
Room Division	3.00	3.94	4.43
General Services	3.74	3.88	4.46
Other Services	3.88	4.08	4.51
Grand Mean	**3.54**	**3.98**	**4.48**

Source: Field Survey, 2018.

Effect of Hotel Guests' Perception and Experience on Satisfaction of Waiting for Service

The linear equation explained the regression results of the effect of hotel guests' experience and perception on the satisfaction of waiting for service.

The regression results are presented below:

$$Y = 7.238 + 0.677X_2^{***} + 0.253X_1^{***} + e$$
$$(1.619) \quad (3.564) \quad (8.978)$$

R Square value = 0.792; F value = 140.935^{***}

Note: *** = ($\alpha_{0.01}$);
Figures in parenthesis are t-ratios.
The result in the model above showed that there was a significant relationship between guests' satisfaction (Y) vis-à-vis their experience (X_1) and perception (X_2) of waiting for service respectively.
The results revealed that guests' perception is a critical factor influencing guests' satisfaction of waiting for service. Interestingly, the coefficient and t-statistics indicated that guests' perception has a statistically significant positive relationship on guests' satisfaction. The slope value of 0.677 means that for a unit change in guests' perception, on the average, the probability of having enhanced guests' satisfaction of waiting for service would increase by 67.7 percent.
Furthermore, the equation shows that the coefficient for guests' experience is 0.253. The implication of this is that for every additional one percent in guests' experience it is expected that guests' satisfaction would increase by an average of 23.3%.
The R-Square is the proportion of variance in the dependent variable (guests' satisfaction of waiting for service) which can be predicted from the independent variables (guests' perception and experience of waiting for service). This value indicates that 79.2% of the variance in guests' satisfaction of waiting for service can be predicted from the variables guests' perception and experience of waiting for service.

CONCLUSIONS

The perception, experience and satisfaction measures in the studied tourism and hospitality service providers involve various aspect that helps them in determining the quality of services they render to their consumers. Based on this, the study concluded that the majority of the hotel guests were tourists, males, married and were between the ages of 18 - 45 years. They are also graduates from either the Polytechnic or a University. However, guests have a high perception, experience and satisfaction levels of waiting for hotel services. Nevertheless, the satisfaction level of the hotel guests was higher than their perception and experience of waiting for hotel services while their experience was higher than their perception. This leads to the fact that the hotel guests were much satisfied despite their level of perception and experience of waiting for hotel services in the studied area. The hotel guests' perception and experience significantly have a positive influence on their satisfaction of waiting for hotel services.
In all, this study had addressed and made contributions to research on the effect of hotel guests' perception and experience on their satisfaction of waiting for hotel services. This information will be of great assistance in the design of tourism and hospitality service providers' strategies, programmes interventions and its implementation in the studied area. By these, the designed strategies and programmes will minimize the waiting time and engage customers in different activities at the property to make their waiting experience pleasurable because several factors such as the type of service, quality of service and the capacity of the location play an important role in the delays. Based on the findings of this study, the following recommendations are made towards ensuring better hotel guests' perception, experience and satisfaction of waiting for service in the studied area of tourism and hospitality.
(i)Preferences of potential guest should be scaled and identified. Through the scaling and identification of guests' preferences, the hotels will lessen the waiting for services and deliver a high quality of services to meet their positive perceptions, better experiences and great expectations.
(ii)The hotel should improve their services in terms of speed, performance, and quality. By improving their services, the rate of guests' satisfaction will increase and positive perceptions, better experiences and great expectations will be met.
(iii)The hotels should improve their quality of services through collective capacity building and training programmes of employees to enhance their performance, efficiency and effectiveness towards increasing their guests' positive perceptions, better experiences,

higher satisfaction and great expectations of their respective hotels in the study area

As it is in almost all studies, there are some limitations in this study too. First, all data were

obtained from a single destination (Ado-Ekiti). This means that the results may not be generalized i.e. the sample consisted of a total of 245 respondents only. The second limitation was related to the sample selection. This research only includes hotels in a city which offers recreation and tourism opportunities to people. Therefore, future studies should focus on different locations and other tourism sites with a wider range of hotels. This would be helpful in validating the findings of this research.

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ESTIMATION OF ENERGY CONSUMPTION AND GREENHOUSE GAS EMISSIONS FROM FERTILIZER USE IN CORN, COTTON AND SOYBEAN PRODUCTION IN TURKEY

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Abstract

This study investigates the energy consumption and greenhouse gas emissions from fertilizer use for corn, cotton and soybean production in Turkey. For corn and cotton cultivation 403.33 kg NPK is applied before planting per hectare, 238.33 kg AN and 238.33 kg urea after planting. For soybean production 201.66 kg DAP before planting per hectare, 135.83 kg AN and 135.83 kg urea after planting are applied. For corn cultivation, 11,991.65 MJ fertilizer energy is consumed per hectare in Turkey. However 8973.56 MJ and 6,452.94 MJ fertilizer energy is consumed per hectares in cotton and soybean production, respectively. The total GHG emissions from fertilizer application are 2,603.7 kg CO_2-eq, 1,949.13 kg CO_2-eq and 1,523.22 kg CO_2-eq per hectares, respectively.

Key words**:** *corn, cotton, soybean, fertilizer, energy, emission*

INTRODUCTION

In order to increase agricultural production, soil should be cultivated, planted, irrigated and diseases and pests should be fought. Along with all these processes, measures should be taken to increase plant nutrition and production. Plants, like humans and animals, have to feed for their growth. Plants take a large part of their nutrients from the soil with their roots. If there is not enough nutrients in the soil to meet the needs of the grown plants, plant nutrients should be given to the soil. If nutrients are not supplied to the soil, production decreases after a while due to the lack of nutrients. The plant needs to be fed in order to get sufficient and quality products. In plant production, organic and inorganic sources are used to achieve the intended yield and quality.

In order to achieve the intended yield and quality in plant production, fertilization is the application of organic or inorganic compounds containing one or more plant nutrients to the soil or directly to the plant. Fertilization has two main purposes:

1)Enriching the soil with plant nutrients

2)Improving the physical and biological properties of soils, providing a better development environment for the plant to be grown.

Due to the fact that it is no longer possible to increase agricultural areas and the diversification of the needs of the population increases, it is necessary to take effective and widespread measures to ensure that more products are taken from the unit area. In order to meet the food needs of the world's population, it requires the use of more inputs to obtain more efficiency from the unit area. In all branches of agriculture, high quality seed, mechanization, plant breeding, as well as effective protection measures, irrigation and rainfall-dependent fertilization is necessary. Vegetable products increased with fertilizer application also form the basis of livestock and agriculture-based industry. According to the researches, the effect of fertilizer on the amount of product to be

obtained in agricultural inputs is determined as 50-60% in developing countries. Fertilizers, which have a share of 10-15% in agricultural product costs, can increase their product yields by more than 50% alone. Therefore, as the nutrients present in the soil do not always meet the needs of the plant, agricultural soils should be enriched with the missing nutrients (Ozturk, 2010) [4].

This study investigates the energy consumption and greenhouse gas emissions from fertilizer use for corn, cotton and soybean production in Turkey.

Energy consumption in chemical fertilizer production

Fertilizer production is an energy intensive sector. Approximately 15% of the total energy consumed in the industrial sector is consumed in the fertilizer production sector (Gielen, 2006) [1]. Different energy sources, mainly hydrocarbons, are used for fertilizer production, fuel and nitrogen are used for ammonia production. Intermediate products are used in compound fertilizer production (Mudahar and Hignett, 1987) [3].

Energy consumption in chemical fertilizer production is examined in two ways as specific energy consumption and total energy consumption. Specific energy consumption is defined as the amount of energy used from fuel, heat, electrical or mechanical energy types to produce a unit of product (fertilizer) (Ramirez and Worrell, 2006) [5].

Total energy consumption is defined as the amount of energy for all processes, including the amount of energy consumed to produce raw materials in a given production process. Total energy consumption can also be defined as a simple life cycle analysis focused on energy use in fertilizer production. For example, specific energy consumption for ammonium nitrate is the amount of heat, fuel and electricity used to produce 1 ton of ammonium nitrate from ammonium and nitric acid, while total energy consumption includes amounts of energy from the types of electricity, heat and fuel used to produce ammonium and nitric acid (Ramirez and Worrell, 2006) [5].

The energy equivalent of chemical fertilizers used in agricultural production is calculated from the energy equivalents of all inputs used in fertilizer production processes. In other words, the energy costs of chemical fertilizers are directly related to the techniques used in the production of these fertilizers. Due to technological developments, the amount of energy used in the production of chemical fertilizers has decreased significantly in recent years.

Greenhouse gas emissions in chemical fertilizer production

The increase in greenhouse gas emissions in the atmosphere increases the importance of CO_2, N_2O and CH_4 emissions released by agricultural practices. These gases are released either directly during agricultural operations or indirectly during the production and transport of necessary inputs such as pesticides and chemical fertilizers. Too much energy is consumed in the production of chemical fertilizers. Therefore, too much greenhouse gas (GHG) emissions occur. Approximately 1.2% of the world's energy consumption is used for chemical fertilizer production. Therefore, approximately 1.2% of the total GHG emissions occur as a result of chemical fertilizer production. Release factors are an important tool for the life cycle analysis of agricultural production systems (Wood ve Cowie, 2004) [6].

During the life cycle of chemical fertilizers, GHG emissions may be released during the extraction, transport and processing of raw materials. Emissions from fertilizer application to the field are not considered here. Significant GHG emissions from fertilizer production are CO_2, N_2O and CH_4. Emission factors are expressed as CO_2 equivalent (g CO_2-e/kg fertilizer) per unit mass of fertilizer.

Ammonia (NH_3) is the primary input for a significant proportion of nitrogenous fertilizer production in the world. In GHG emissions for nitrogenous fertilizer production, N_2O emissions resulting from the production of CO_2 and nitric acid from ammonia production play an important role. Ammonia synthesis is a process with high energy consumption. Today, in the steam configuration process for fertilizer production, approximately 25-35 GJ of energy is consumed per tonne of ammonia

produced. The main energy source for ammonia synthesis is natural gas. The CO_2 produced by the consumption of natural gas or other hydrocarbons to meet the energy requirements of the process is the most important greenhouse gas produced by ammonia production (Wood ve Cowie, 2004) [6].

Urea constitutes approximately half of the nitrogenous fertilizer production in the world. Urea synthesis is based on the principle of combining ammonia and carbon dioxide at high pressure to form ammonium carbonate. As a result of urea production, CO_2 is released during ammonia synthesis (Wood ve Cowie, 2004) [6].

The main greenhouse gas released by phosphorus fertilizer production is CO_2. CO_2 is released as a result of consuming fossil fuels as an energy source for various production processes related to the production of phosphorus fertilizers. The net emission values from phosphorus fertilizer production can be determined depending on the sulphuric acid production method.

MATERIALS AND METHODS

The main characteristics of the fertilizers used in corn, cotton and soybean production in Turkey are given in Table 1.

Table 1. Application Rate and Times of Fertilizers for Crops in Turkey

Fertilizers	Chemical Contents (%)
Ammonium nitrate (AN)	33.5 N
Ammonium phosphates (DAP)	18 N, 46 P_2O_5
NPK 15-15-15	15N-15P_2O_5-15K_2O
Urea	46 N

Source: Own research results.

The application rate and times of fertilizers for crops in Turkey are given in Table 2-4.

Table 2. The Application Rate And Times Of Fertilizers For Corn

Crop	Corn	
Application time	**Before sowing**	**After sowing**
Fertilizers	**Application rate (kg/ha)**	
Ammonium nitrate		238.33
NPK 15-15-15	403.33	
Urea		238.33

Source: Own research results.

Table 3. The Application Rate And Times Of Fertilizers For Cotton

Crop	Cotton	
Application time	**Before sowing**	**After sowing**
Fertilizers	**Application rate (kg/ha)**	
Ammonium nitrate		181.25
NPK 15-15-15	287.5	
Urea		181.25

Source: Own research results.

Table 4. The Application Rate And Times Of Fertilizers For Soybean

Crop	Soybean	
Application time	**Before sowing**	**After sowing**
Fertilizers	**Application rate (kg/ha)**	
Ammonium nitrate		135.83
Ammonium phosphates	201.66	
Urea		135.83

Source: Own research results.

In corn and cotton production 403.33 kg NPK is applied before planting per hectare, 238.33 kg AN and 238.33 kg urea after planting. In soybean production 201.66 kg DAP before planting per hectare, 135.83 kg AN and 135.83 kg urea after planting are applied.

Energy input of fertilizer consumption

The amount of energy consumed related to fertilizer using in unit production area (ha) for crop cultivation is calculated depending on the application rate of fertilizer used and energy consumption per kg product for fertilizer production on site, as it can be seen down below:

$$E_f = M_f \times PE_f \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

where:

E_f = Fertilizer energy consumption (MJ/ha),
$\boldsymbol{M_f}$ = Application rate of fertilizer (kg/ha) and
PE_f = Production energy of fertilizer (MJ/kg).

Calculation methodology used for carbon dioxide emissions

The following equation outlines the recommended approach to calculating total GHG emissions based on fertilizer use.

$$GHG = M_f \times ECE_f \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

where:

GHG = Total CO_2-eq emission per area ($kgCO_2$-eq/ha),
$\boldsymbol{M_f}$ = Application rate of fertilizer (kg/ha) and
ECE_f = Total CO_2-eq emission per kg product for production and application of fertilizer (kg CO_2-eq/kg) (Table 5).

Table 5. The Application Rate And Times Of Fertilizers For Soybean

Fertilizers	Energy consumption for production on site (MJ/kg)
Ammonium nitrate (AN)	14.02
Ammonium phosphates (DAP)	6.76
NPK 15-15-15	7.59
Urea	23.45

Source: IPCC, 2006 [2].

RESULTS AND DISCUSSIONS

Energy consumptions for fertilizer production

The energy consumptions for fertilizer production are given in Figure 1. The approximately 23.45 MJ energy per product is consumed for production of urea on site. On the other hand, 14.02 MJ energy is consumed for production of AN. For the production processes of NPK and AN fertilizers in factories, 7.59 MJ and 6.76 kg energy are consumed per kg product, respectively.

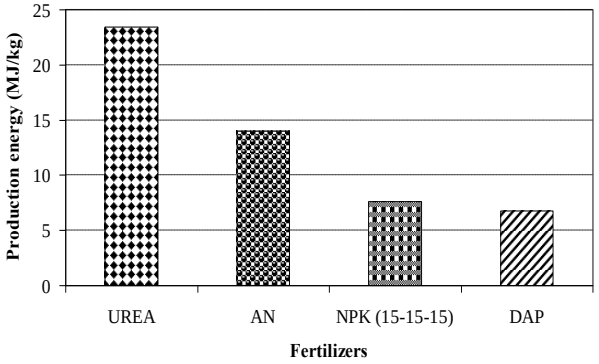

Fig. 1. The Energy Consumptions For Fertilizer Production
Source: Own research results.

Fertilizer applications for crops

The fertilizer applications for crops are given in Figure 2.

For corn and cotton cultivation 403.33 kg NPK is applied before planting per hectare, 238.33 kg AN and 238.33 kg urea after planting. For soybean production 201.66 kg DAP before planting per hectare, 135.83 kg AN and 135.83 kg urea after planting are applied.

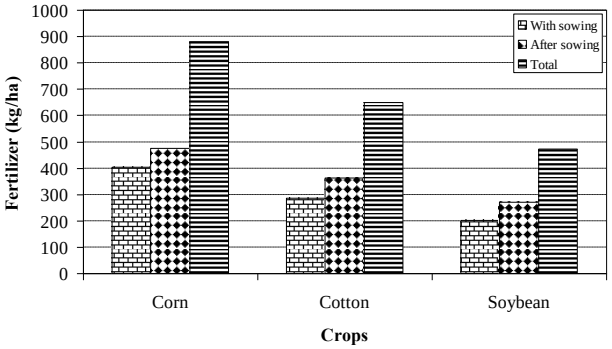

Fig. 2. Fertilizer Applications For Crops
Source: Own research results.

Fertilizer energy consumptions for crops

The fertilizer energy consumptions for crops are given in Figure 3. For corn cultivation, 11,991.65 MJ fertilizer energy is consumed per hectare in Turkey. However 8,973.56 MJ and 6,452.94 MJ fertilizer energy is consumed per hectares in cotton and soybean production, respectively.

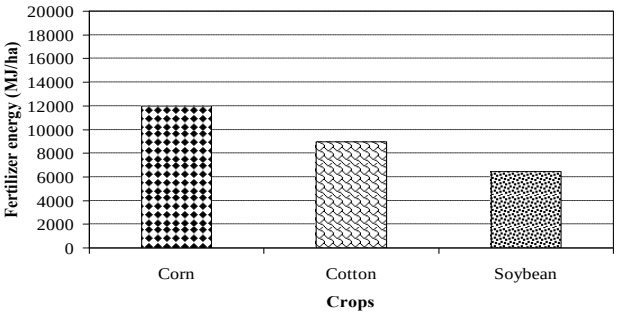

Fig. 3. Fertilizer Energy Consumptions For Crops
Source: Own research results.

GHG emissions from fertilizer production and application

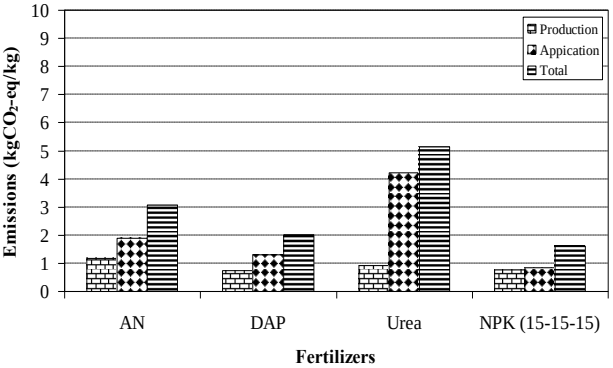

Fig. 4. GHG Emissions For Production And Application Of Fertilizers
Source: Own research results.

Figure 4 gives the levels of GHG emissions per kg product from fertilizer production and application depending on the fertilizer types. The GHG emissions from production of AN fertilizer in factory and field application are 1.18 kgCO_2-eq and 1.89 kgCO_2-eq per kg product, respectively. Therefore, the total GHG emission from AN utilization is 3.07 kgCO_2-eq per kg product.

Application of 1 kg urea and DAP fertilizers to the field cause 4.22 kgCO_2-eq and 1.3 kgCO_2-eq emissions, respectively. When these values are added to the GHG emissions from the production of these fertilizers, a total of 5.13 kgCO_2-eq and 2.03 kgCO_2-eq of emissions are generated, respectively. The GHG emissions from production of NPK (15-15-15) fertilizer in factory and field application are 0.76 kgCO_2-eq and 0.85 kgCO_2-eq per kg product, respectively. Therefore, the total GHG emission from NPK (15-15-15) utilization is 1.61 kgCO_2-eq per kg product.

Figure 5 gives the levels of GHG emissions per kg hectare from fertilizer application for crop cultivations. The total GHG emissions from fertilizer application are 2,603.7 kg CO_2-eq, 1,949.13 kg CO_2-eq and 1,523.22 kg CO_2-eq per hectares for corn, cotton and soybean cultivation, respectively.

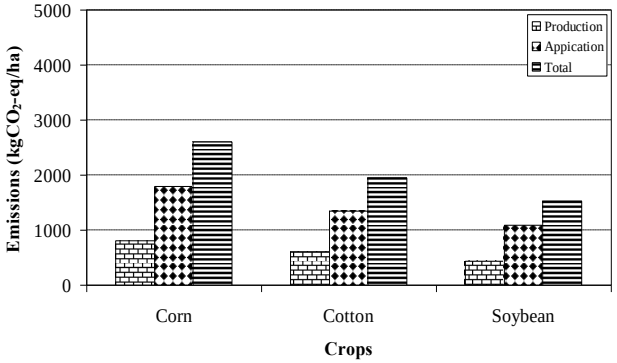

Fig. 5. GHG Emissions For Application Of Fertilizers
Source: Own research results.

CONCLUSIONS

For corn cultivation, cotton and soybean cultivation in Turkey, 11,991.65 MJ, 8,973.56 MJ and 6,452.94 MJ of fertilizer energy is consumed per hectare.

In Turkey, the total GHG emissions from fertilizer application are 2,603.7 kg CO_2-eq, 1,949.13 kg CO_2-eq and 1,523.22 kg CO_2-eq per hectares for corn, cotton and soybean cultivation, respectively.

Improvement in energy efficiency is the main target of developments in fertilizer production technology. The responsible production and use of mineral fertilizers in agriculture should be considered not only as an essential part of the global production of food, but also as part of the solution to climate change problems. Because growers cannot influence the climatic conditions under which they operate, efforts should be focused towards maintaining a good soil structure that enables good drainage and avoids water logging. The choice of the right N fertilizer product under the given conditions (e.g. nitrate-based products applied on non-waterlogged soils) can help minimize N_2O emissions from the soil.

Energy efficiency measures can be applied at all stages along the agrifood chain. Energy efficiency improvements can bring direct savings through technological or behavioural changes, or indirect savings through co-benefits derived from the adoption of agroecological farming practices. For both large and small systems, any means of avoiding food wastage should be encouraged and can result in considerable savings in the energy, land and water used to produce this food that no one consumes. Knowledge-based precision farming provides reliable and flexible fertilizer applications.

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ENERGY CONSUMPTION AND GREENHOUSE GAS EMISSIONS FROM IRRIGATION APPLICATIONS AT DIFFERENT HEIGHTS IN CORN AND SUGARBEET PRODUCTION IN KUZOVA REGION OF TURKEY

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Abstract

The main method for providing water for irrigation purposes is the transmission of water between the water source and the field for irrigation. This movement of water requires an energy. Therefore, the effects of irrigation applications at different heights on energy consumption and greenhouse gas emissions (GHGs) in Kuzova region in Elazıg province of Turkey were evaluated in this study. While energy consumption for sugar beet irrigation is 3.46 GJ /ha at a height of 30 m, it reaches 10.26 GJ/ha for irrigation of more than 150 m. However, while fuel consumption for corn irrigation is 3.71 L GJ/ha at a height of 30 m, it reaches 12.73 GJ/ha for irrigation of more than 150 m. While the GHG emissions from sugar beet irrigation is 256.27 kgCO_2-eq/ha at a height of 30 m, it reaches 759.66 kgCO_2-eq/ha for irrigation of more than 150 m. However, while the GHG emissions from corn irrigation is 274.58 kgCO_2-eq/ha at a height of 30 m, it reaches 942.71 kgCO_2-eq/ha for irrigation of more than 150 m.

Key words**:** *corn, sugar beet, irrigation, energy, GHG emissions*

INTRODUCTION

As with all living things, plants need water in order to survive. The required water is taken from the soil mainly with plant roots. Some of the water taken up by the plants is used in the production of various compounds and mainly for photosynthesis. A very important part is given to the atmosphere by sweating. The amount of water remaining in the plant and used in various physiological processes is too small to be taken into consideration besides the amount of water supplied to the atmosphere by transpiration process. Therefore, irrigation is a very important input in agriculture and it is one of the most important factors that increase the yield. When the amount of water that the plant needs cannot be met by rainfall, the application of it to the soil with different irrigation methods and systems is called irrigation. Irrigation crop yield; plant, soil, irrigation method used, depending on climate and production conditions can increase between 1 and 5 times [6]. However, over-applied irrigation reduces productivity; Soil drainage, salinity and aridity (sodium) can cause problems.

Agriculture currently uses 11% of the world's land surface, and irrigated agriculture uses 70% of all water withdrawals on a global scale [9]. Rainfed agriculture is the predominant agricultural production system around the world, and its current productivity is, on average, little more than half the potential obtainable under optimal agricultural management. Water scarcity and decreasing availability of water for agriculture constrain irrigated production overall, and particularly in the most hydrological stressed areas and countries. As many key food production systems depend on groundwater, declining aquifer levels and the depletion of non-renewable groundwater put local and global food production at risk. Increasing food production is not, on its own, sufficient to achieve food security and eradicate hunger. Hunger can persist in the midst of adequate national and global food supplies. Efforts to

promote food production must be complemented by policies that enhance household access to food, either by creating employment and income opportunities or by establishing effective safety net programmes.

Water, energy and food are inextricably linked. Water is an input for producing agricultural goods in the fields and along the entire agrifood supply chain. Energy is required to produce and distribute water and food: to pump water from groundwater or surface water sources, to power tractors and irrigation machinery, and to process and transport agricultural goods. Agriculture is currently the largest user of water at the global level, accounting for 70% of total withdrawal [2]. The food production and supply chain accounts for about 30% of total global energy consumption [3].

There are many synergies and trade-offs between water and energy use and food production. Using water to irrigate crops might promote food production but it can also reduce river flows and hydropower potential. Growing bioenergy crops under irrigated agriculture can increase overall water withdrawals and jeopardize food security. Converting surface irrigation into high efficiency pressurized irrigation may save water but may also result in higher energy use. Recognizing these synergies and balancing these trade-offs is central to jointly ensuring water, energy and food security. Estimates suggest that global food production will need to increase by as much as 60% by 2050 to meet demand [4, 5]. Achieving such a dramatic increase is a formidable challenge.

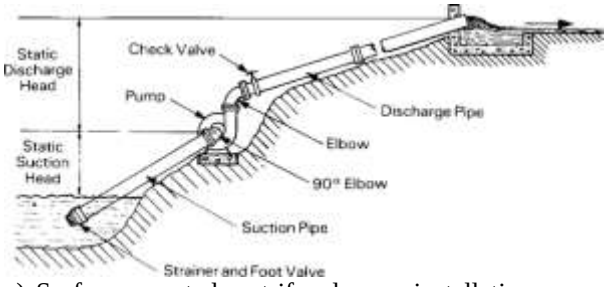
The main method for providing water for irrigation purposes is the transmission of water between the water source and the field for irrigation. This movement of water requires energy. Therefore, the effects of irrigation applications at different heights on energy consumption and greenhouse gas emissions (GHGs) in Kuzova region in Elazıg province of Turkey were evaluated in this study.

Pumping facility for irrigation

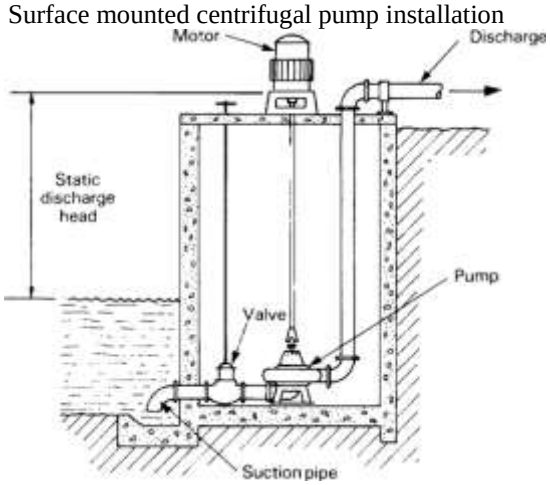
The millions hectares that are irrigated by groundwater account for most of the energy used for irrigation. As groundwater irrigation, in general, provides greater flexibility than other types in responding to fluctuating water demands, its relative importance is likely to increase in the future. Groundwater for irrigation can be withdrawn from both shallow and deep aquifers. Where extraction rates from shallow groundwater stores exceed recharge rates, water abstracted from greater depths, pumped by energy intensive electric pumps, will likely become more important. Avoiding groundwater depletion, through sustainable groundwater management, can lead to long term cost and energy savings [10].

Pumping facility

The main method for providing water for irrigation purposes is the transmission of water between the water source and the field for irrigation. This movement of water requires energy. All mechanical tools and materials used for the transmission of water between the source and the field form the pumping plant (Fig. 1).



a) Surface mounted centrifugal pump installation



b) Below-surface centrifugal pump installation

Fig.1. Pump installations

Source: [6]

The design, selection, installation, operation and maintenance of the pumping plant include important engineering issues. The main

purpose here is to provide the irrigation water required by the plant to be irrigated in time, with sufficient amount, with minimum energy and operating expense.

The water source can be an underground or surface source. Various methods are applied to distribute the water in the field and deliver it to the plants. In surface irrigation method, irrigation water is carried by open channels and gravity is used for flow. The water taken from the channels is delivered to the plants by means of pans or furrows. In the sprinkler irrigation method, water is transported to the plants with the energy provided from the pumping plant and disintegrated into drops in special nozzles and delivered to the field. Therefore, the sprinkler irrigation method requires more energy for the pumping plant. This should be taken into consideration in the project.

In the pumping plant, the pump delivers the energy it receives from a force machine to the water. With this energy, water is transported through the pipelines from the water source to the field. Pumping facilities include building materials, electrical equipment, piping systems, pumps, valves and motors. As a unit consisting of a pumping station, a power machine and a construction machine, irrigation water needs to be able to meet the required amount of time and with the lowest energy consumption. This issue has become even more important, especially in today's rapidly increasing energy costs. In a pumping station, the pumps account for 8% of the construction cost and 60% of the operating cost [8].

The following factors should be considered for energy efficient pumping facilities [1]:

-Suitability of the pump characteristics to the pumping facility.

-Variability of water flow rate.

-Suitability of pipelines to the facility.

-Compatibility of pump and system with variable speed pumping in variable flow pumping facilities.

-Compliance of pump specifications with standards.

The entire facility can be considered as an energy exchange unit. Accordingly, the energy supplied by the fuel or electric current is first converted into mechanical energy in the motor and then transmitted to the water by the pump. If there is a power transmission arrangement between the motor and the pump, the transmission efficiency of this arrangement must also be considered.

In this case, the total system efficiency should be high in a pump station that can achieve the above purpose. In other words, it is necessary to provide more hydraulic energy for the unit fuel or electricity consumed. For this purpose, the following four basic issues should be well known and applied when planning a pumping facility [11]:

(i)Planning of pipeline

(ii)Selection of pump

(iii)Selection of force source

(iv)Operation and maintenance of the facility

Heights in pumping facility

The task of the pump in the pumping facility is to transmit the energy required to transfer water from one medium (water source) to another (area to be irrigated).

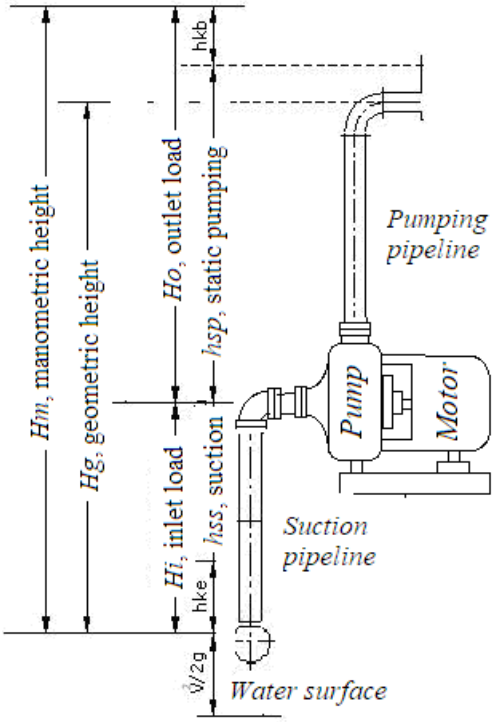


Fig. 2. Heights at the pumping facility
Source: Own drawing.

With this energy, water rises from one position to the other, and defeats the resistances in the pipelines in which it moves.

The pump receives mechanical energy from a source of force and transmits this energy to the water through its moving units. It refers to a height term as the energy given to the unit weight of water during this change, and is often referred to as the meter water column (mSS). The term *load* or *height* is the vertical distance between the free surface of the water body elementally and any reference plane. This value indicates the ability to do energy or work. The operating heights of the pump in a pumping facility are shown in Fig. 2.

If the position difference between the water source and the highest point at which the water is raised (*Hg*, geometric height) is the energy requirement (*hk*) caused by the flow of water in the pipelines between these two points, the total energy for the movement of the water is defined as follows [7]:

$$H_m = H_g + h_k \quad \text{.....(1)}$$

The manometric height (*Hm*) of the pumping facility depends on the difference in elevation between the water source and the area to be irrigated, and the length, diameter, type and auxiliary pipe parts used in the pipelines to be used for water transmission.

In other words, *Hm* is determined by the pipelines of the pumping facility. *Hm* is the height used to determine the energy required to transmit water from the level of suction to the highest level at which it is pumped.

MATERIALS AND METHODS

Study area description

Elazıg province is located in the Upper Euphrates Section in the southwest of the Eastern Anatolia Region in Turkey. The province consists of 11 districts, 537 villages and 709 hamlet settlements together with the central district.

Uluova is one of the most important plains. The plain part of the plain is bare. Kuzova is a very long plain and very efficient. The crop in the region is abundant and varied. In addition, Murudu, Zahini, Adedi, Karayazı, Baskil and Hanpınar Plains are known as the main plains.

In terms of agricultural structure; 29% of the province's surface area is located on an area of 264,123 hectares. In 176,717 hectares of this area, fallow farming, 68,531 hectares of irrigated agriculture and 18,875 hectares of vineyard-garden are cultivated.

In Elazıg province, a different and characteristic climate is observed. The geographical location and morphological characteristics of the province have been the most important factor in the emergence of this favorable situation. In the province, continental climate is dominant, winters are cold and rainy and summers are hot and dry. However, the reservoirs formed around the province show partial deviations in the climate.

Since the structure of the soil is medium or permeable soil throughout the province, no significant irrigation problem has been encountered. Considering the water and soil characteristics, it is possible to say that it has a soil and water structure suitable for agriculture.

Products grown in Elazıg vary widely. In dry agricultural areas, cereals are predominant. Wheat, barley, chickpeas and lentils are the main. In recent years, many high places and plain ova-irrigated irrigation in cereals grown in dry agriculture has been replaced by industrial plants grown in irrigated agriculture. Cotton, tobacco and sugar beet are the major ones. The belt, Keban and Baskil districts have gained importance. In addition, melon, watermelon and other fruits and vegetables are grown by the local people.

Kuzova is a long plain on both sides of the Cip (Sarini) river, which flows into the North and joins the Murat River. The north of the plain, which is 900-1,000 meters above the sea extending to the north, has an area of approximately 110 km^2. Kuzova showing a stepped situation is an efficient plain. Alluvial soils are found only in the valley of Sarini Stream. This river is not enough to water the water is low. For this reason, Cip Dam was constructed for irrigation purposes and many wells were drilled. Kuzova is divided into two parts by a series of hills consisting of Tilki Tepe Karsıdag-Kurt Tepe-Kızıldag and Kekliktepe in the south and extending in the

southwest and northeast direction and resembling a ridge. The northern part of the plain, which corresponds to Kuzova, which covers a much wider area, is in a syncline. The eastern part of the Kuzova basin consists of a volcanic terrain. Here, the olivine basalts, which had emerged from an east-west direction, formed a series of lapses towards the north in the direction of the slope of the plain.

Kuzova irrigation project consists of two parts. Elazıg Kuzova pumping irrigation project consists of two parts: Ziyarettepe and Meseli. The water to be taken from Keban Dam Lake is 290 meters with the water pump project, and the Meseli Pumping Irrigation Project is 279 meters in total and 219 thousand 90 decares of agricultural land is planned to be irrigated.

Calculation methodology of GHG emissions in irrigation applications

Diesel-based energy inputs = Diesel used × Lower heating value

Diesel-based CO_2 emissions = L/ha × 0.0371 GJ/L

Diesel-based CO_2 emissions = GJ/ha

Diesel-based CO_2 emissions = Diesel used × Lower heating value × Emission factor

Diesel-based CO_2 emissions = L/ha × 0.0371 GJ/L × 74.01 kgCO_2/GJ

Diesel-based CO_2 emissions = kgCO_2/ha

RESULTS AND DISCUSSIONS

Fuel consumption for irrigation

The fuel (diesel) consumption at different heights for irrigation of corn and sugar beet productions are given in Fig. 3.

While fuel consumption for sugar beet irrigation is 93.33 L/ha at a height of 30 m, it reaches 276.66 L/ha for irrigation of more than 150 m.

However, while fuel consumption for corn irrigation is 100 L per hectares at a height of 30 m, it reaches 343.33 L/ha for irrigation of more than 150 m.

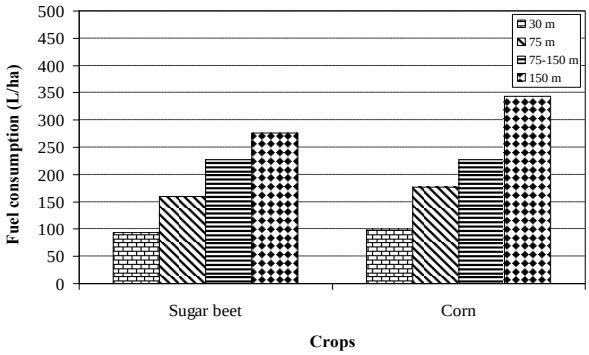


Fig. 3. The fuel consumption for irrigation
Source: Own calculation.

Energy consumption for irrigation

The energy consumption at different heights for irrigation of corn and sugar beet productions are given in Figure 4. While energy consumption for sugar beet irrigation is 3.46 GJ /ha at a height of 30 m, it reaches 10.26 GJ/ha for irrigation of more than 150 m. However, while fuel consumption for corn irrigation is 3.71 L GJ/ha at a height of 30 m, it reaches 12.73 GJ/ha for irrigation of more than 150 m.

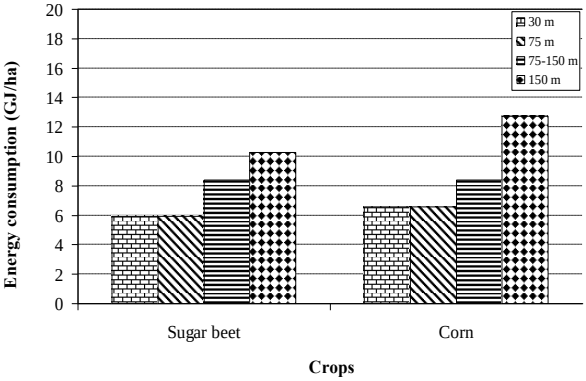


Fig. 4. The energy consumption for irrigation
Source: Own calculation.

GHG emissions from irrigation applications

Figure 5 gives the levels of GHG emissions per hectares from irrigation applications depending on the heights. While the GHG emissions from sugar beet irrigation is 256.27 kgCO_2-eq/ha at a height of 30 m, it reaches 759.66 kgCO_2-eq/ha for irrigation of more than 150 m. However, while the GHG emissions from corn irrigation is 274.58 kgCO_2-eq/ha at a height of 30 m, it reaches 942.71 kgCO_2-eq/ha for irrigation of more than 150 m.

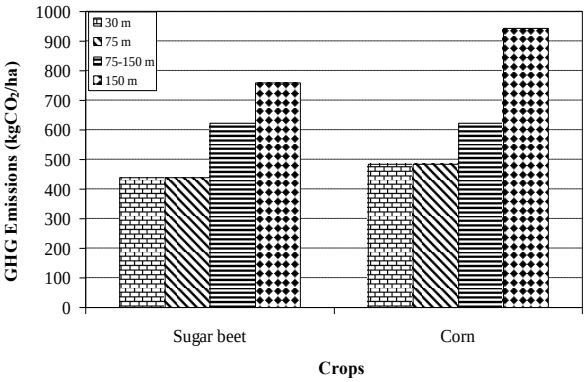


Fig. 5. GHG emissions for irrigation applications
Source: Own calculation.

CONCLUSIONS

Mechanical irrigation systems should be designed to use water as efficiently as possible. Crops often take up only half of the irrigation water applied, so there is clearly potential to improve water use efficiency, which would also result in less demand for electricity or diesel fuel for pumping. However, much controversy and debate exist about the engineering concept of 'water use efficiency. It is widely accepted that, while irrigation losses appear high, a large part of these 'losses' return to the river basin in the form of return flow or aquifer recharge, although the water quality of the return flows may have been altered. Measures to increase water use efficiencies upstream, while maintaining existing levels of withdrawal, will increase the productive efficiency of water use, but at the same time, may deprive downstream users who depend on return flow in rivers or groundwater aquifers fed from these returns.

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A TERRITORIAL APPROACH FOR ECONOMIC DEVELOPMENT OF RURAL AREAS. CASE OF BULGARIA

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Abstract

The implementation of the EU Cohesion Policy has contributed to numerous improvements and positive effects on local economies. However, it has not entirely succeeded in overcoming the economic and social disparities across territories. The article reviews the practical aspects of the implementation of the LEADER and Common local led development (CLLD) approaches in Bulgaria. It also provides a comparative analysis of both Integrated Territorial Investments (ITIs) and CLLD. The objective is to show the impact of CLLD on decreasing the economic divergence between urban and rural municipalities and to identify the main difficulties in CLLD implementation that need further improvement.

Key words**:** *rural and urban municipalities, Common local led development (CLLD), integrated territorial approach, Integrated territorial Investments (ITISs), EU cohesion policy*

INTRODUCTION

The territorial dimension has been considered as a priority of the EU Cohesion Policy since 2009 as a result of the Barca report [2]. Since then various territorial tools have been devised for the implementation of the EU Cohesion Policy including Integrated Territorial Investments (ITIs) and Common local led development (CLLD).

The EU defines ITIs as "a territorial mechanism that enables the implementation of a territorial strategy in an integrated manner while drawing funds from at least two different priority axes in the same or different programs" [4].

CLLD, on the other hand, can be described as a tool "involving partners at local level including the civil society and local economic actors in designing and implementing local integrated strategies that help their areas to make a transition to a more sustainable future" [5].

Both territorial approaches (ITIs and CLLD) refer to integrated actions in urban and rural territorial areas with similar economic and social characteristic and needs. The implementation of the integrated strategies and investment in the defined territories is also included in the future EU Cohesion Policy. One of the objectives for the upcoming programming period (2021-2027) is "Europe closer to citizens" [1, 10].

This objective would bring new challenges related to the introduction of a new regional balanced approach aimed at investment in integrated measures, which have to be tailored to the specificities of the regions.

MATERIALS AND METHODS

The article briefly presents the characteristics and philosophy of both ITIs and CLLD. A comparison between the two allows to examine their similarities and differences and to discern the main advantages and disadvantages associated with each approach. This comparative analysis assists in better understanding how they can be used to complement each other. The author then measures the impact of the territorial approaches CLLD and LEADER on the economic development of the municipalities by carrying out a descriptive analysis (standard deviation and median). The purpose of the analysis is show the divergence in value of the indicators incurred in the implementation of integrated territorial strategies (LEADER and CLLD). Finally, the article looks at the implementation of the

LEADER and CLLD approaches and the distribution of the financial resources from the European structural funds across the measures included in the local strategies.

The data for the period (2013-2018) was obtained from the Bulgarian National Statistical Institute. The descriptive analysis includes all Bulgarian municipalities and refers to following economic indicators: number of unemployed, number of unemployed up to 29 age, number of long-term unemployed, unemployment rate, the average annual income per person, net revenues from sales (thousand BGN) and output (thousand BGN). The municipalities are divided into rural municipalities with and without local action groups (LAGs), and urban municipalities.

RESULTS AND DISCUSSIONS

Legislative framework

The starting point of territorial cohesion policy consisted in the adoption of two main documents by the European Commission: the Green Paper on Territorial Cohesion in 2008 [8] and the EU Territorial Agenda in 2011. [9] The Green Paper contributed to an open discussion on the territorial dimension of the EU cohesion policy and focused the attention on the needs to apply integrated territorial approach. The Territorial Agenda delineated the main goals for overcoming the economic and social discrepancies across regions, which are due to the urbanization, concertation of the production in big cities and depopulation of the small towns and settlements. The priorities of the Territorial Agenda can be defined as polycentric and balanced territorial development, territorial integration, improving territorial cooperation among communities, enterprises and cultural institutions [9].

The legislative documents of the EU cohesion policy (2014-2020) ensure the implementation of the integrated territorial investments. In the current programming period (2014-2020), CLLD was introduced in the Common Provisions Regulation (CPR) No 1303/2013 (articles 32-35), which sets out the requirements for developing local strategy and establishes the responsibilities of the stakeholders participating in the local action group [22]. The EU Regulation on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) No 1305/2013 (article 42-44) provides rules supporting LEADER programmes directed at inter-territorial co-operation between rural municipalities [24].

The Integrated territorial investments are determined by the CPR in article 36 and the integrated actions are set out in articles 37-46 [22]. The EU Regulation No 1301/2013 on the European Regional Development Fund (ERDF) provides in article 7 that 5% of the resources are to be allocated to the measures included in integrated sustainable urban development strategies [23]. For the current programming period, ITIs are funded by €13.8 billion from the ERDF, € 1.7 billion from ESF and € 0.3 billion are allocated by Cohesion Fund [7].

In addition, the main strategic document defining the commitments of the EU Member States to manage CLLD on the national level for the current programming period is the Partnership Agreement. It outlines the interaction of the managing bodies of the operational programs involved in the implementation of the CLLD [21].

Bulgaria adopted the European Structural and Investment Fund Funds Management Act in 2015 [14], which defines the national institutional framework for the management of European Structural and Investment Funds. In accordance with the provisions of article 28, paragraph 1, item 2 the Council of Ministers lays down rules for coordination between the managing authorities of the operational programmes and the local action groups engaged in developing and implementing the integrated multi-funded CLLD strategy.

Comparison between ITIs and CLLD

To better understand the differences and similarities between ITIs and CLLD, the author compares the two approaches in the Table 1 below.

This comparison shows that the main differences refer to the framework of

governance, the size of the projects and sources of finance.

Table 1. Key differences between ITIs and CLLD

	Differences	
	CLLD	ITIs
Territorial scope	Sub-regional level: it covers neighboring municipalities	Urban areas with potential for economic development
Management	Bottom-up decentralized approach LAGs play a key role in developing and executing the multi-funded local strategy	Top-down centralized approach ITI is led by governmental entity jointly with intermediate bodies at regional level. ITI approved by the central government
Financing	Small-scale projects limited to € 200 000 LAGs allocate the financial resources to projects beneficiaries	Large-scale projects Public funds are allocated by governmental and public institutions

Source: summarized by author.

The ITIs are funded by European structural funds and private resources, while the CLLD is funded by EAFRD and European Structural Funds and is therefore a multi-funded strategy. This multi-funded strategy creates conditions for economic diversification of rural municipalities through developing manufacturing, rural and eco-tourism, crafts, restoration cultural and traditional arts and others. The comparison also indicates that there are numerous similarities between the two approaches. The ITIs and CLLD are both oriented to territorial priorities and enhance the economic interaction at the territorial level. The similarities between the two approaches could be briefly summarized as follows: both the ITI s and CLLD (1) cover urban and rural territories; 2) make use of multi-funded integrated strategy tailored to ESFs priorities; 3) aim at ensuring long-term social and economic benefits for territorial settlements; 4) contribute to the establishment of partnerships between stakeholders, businesses and local and regional authorities; 5) promote territorial integration; 6) create conditions for enhanced labour mobility. These similarities could be used for the two tools to be jointly applied at the defined territories.

Bottom-up approach of CLLD implementation: an opportunity for developing economic potential in rural areas

Disparities between large and small cities and rural areas is a major concern for Bulgaria's regional development. Territorial inequalities are widening due to population loss, worsen demographic structure, low production and investment potential.

The Common Agricultural Policy (CAP) supports rural areas to decrease the territorial economic and social differences and depopulation by encouraging economic diversification and entrepreneurship. The CAP policy applies specific territorial approach designed to promote local economy and entrepreneurship known as LEADER initiative, first adopted in the 1990s, and which played a critical role in reorienting rural development beyond agricultural policies. LEADER is a territorial approach for rural development whose purpose is to "mobilize economic actors in defined territorial areas to collaborate in designing and implementing a local development policy" [11]. LEADER is addressed mainly to rural municipalities.

In the current programing period, the CLLD has been extended to urban territories. The local strategy therefore covers territories with population from 10,000 to 150,000 [5] which means that it includes small and less-development settlements around big cities in urban areas.

The applied CLLD strategies are a combination of interventions mainly funded by ERDF, ESF and EAFRD while the funding from the Cohesion fund is less prominent as it is dedicated only to ecological and climate projects.

The main difference between CLLD and LEADER initiatives concerns the diversified

financial source: as shown above, the CLLD uses more than one ESIF, while LEADER is mono-funded by EAFRD. The applied multi-funded integrated strategy aims at achieving the synergy of economic, social and environmental development trough cooperation between neighboring municipalities regardless of their population and economic development. The European LEADER Association for Rural Development pointed out that in Europe the total number of LAGs is 3,073, the number of LAGs under multi-funded strategy (EAFRD) is around 2761 in Europe [6]. Additionally, the local territorial strategies in Europe funded by EAFRD contributed benefits for 56 percent of the total rural population (163 million inhabitants [25].

Main challenges facing the rural municipalities in Bulgaria

Bulgaria is divided into six planning regions (NUTS 2 level), 28 districts (district is a central government territorial administration, with governors appointed by the Council of Ministers, (NUTS 3 level) and 265 municipalities (LAU 1). The rural regions include all municipalities where the number of the population is up to 30,000 people. Following this definition, the Bulgarian rural regions encompass the territories of 232 municipalities, which comprise of 34 percent or 2.3 million of the total country's population. However, 66 percent of the population live in municipalities with more than 30,000 inhabitants.

The current Bulgarian operational programme "Regions for growth" [20] funded by the EFRD is targeted at sustainable urban development, mainly in big urban cities, which are administrative and economic centers of municipalities above 30,000 inhabitants. Investment intervention covers 39 municipalities which do not belong to the category of rural municipalities. Bulgarian municipalities provided integrated urban development plans in which measures were funded by ERDF and European Social Fund or attracting private sector resources trough public-private partnership. The urban integrated plans include measures for: improvement of urban environment, development of industrial and social zones including cultural, social, educational infrastructure, energy efficiency for residence and public buildings [3]. Urban integrated plan could be considered as a territorial approach because of the concentration of public funds on pre-defined zones of the big cities. However, Bulgaria has not used ITIs as a tool for territorial development covering many local municipalities, not only large urban cities.

Despite the EU cohesion policy funding the differences at an intra-regional and inter-regional levels continue to increase in Bulgaria. Most Bulgarian regions are defined as lagging behind because of negative demographic trends and increase of aging population.

Throughout the period 2010-2018 the number of the population in the rural municipalities has declined faster than the average level for the entire country. During the same period the population in rural areas declined by 14 percent as a consequence of the negative natural birth rate, the migration and mobility of the work force to towns, high speed process of urbanization. The population below 15 years of age is low, around 6 percent, it is significantly lower than the population in urban areas - where it is 15 percent or 20% for the entire country. By contrast, the share of the 65 aged population lives in rural settlements is 22 percent. During the period 2010-2018, the number of working age population dropped down by 12 percent, while the population above 65 age increased by 5 percent. Most of the people in working age (around 76 percent) live in towns and only 24 percent live in villages. The annual unemployment rate was 4.7 percent in 2018, but in the rural municipalities the unemployment rate is higher, i.e. it is between 10 to 25 percent [18].

The trend of high annual unemployment rate has not changed for the poorest regions in the country (i.e., Northwest and North-East regions) due to the lack of industrial enterprises and the low level of education and qualification of the workforces.

Small municipalities (from 5,000 to 10,000 inhabitants) in rural areas, suffer from

structural problems because their main sector of activity is agriculture, which offers seasonal work and temporary income. Moreover, additional concerns include lack of attractive employment opportunities, insufficient investment, lack of profitable manufactured enterprises and a significant outflow of young people.

In Bulgarian rural areas, LAGs have been established upon the initiative of local governments, entrepreneurs and civil associations within a certain territory or community in order to implement objectives related to the EAFRD.

The number of the created LEADER LAGs in the former programing period (2007-2013) was 35, which included 57 rural municipalities (28 percent of the defined rural territory) and local strategies impact on 800,000 people. The LAGs contributed to the completion of 1,221 projects [14], which have been carried out successfully and their activities encompassed 1,090 settlements [15]. The strategies of many LAGs across the country were similar; in particular, LAGs in Bulgaria developed a strategy and a package of measures under the Rural Development program, mainly in the agriculture sector (technological modernization and enhancement of the competitiveness of agricultural holdings), economic diversification, and support for local entrepreneurship, small businesses, local heritage, rural tourism and reconstruction of public facilities.

The economic impact of the completed projects was the creation of the new jobs (around 2,000) in rural tourism, retail, renewable energy production, crafts and manufacturing small and micro enterprises. The total amount supporting the LAGs was around €70 million (EAFRD and national co-funding), which was approximately 1.7 percent of the Regional Development program budget [15].

The LAGs experienced some difficulties in relation to the organization of application procedures and lack of sufficient finances to cover administrative and operational management costs [15, 17] The delays at various phases of the projects including the initial stage of negotiation, the verification of the project costs and paying to beneficiaries within the set time limit was a key obstacle for finalizing the projects according to the schedule. This also lead to delay in the implementation of the planned activities and restructuring the financial plan of LAGs strategy. One of the drawbacks of LEADER programme was a weak cooperation in transferring experience among created local groups. The majority of LAGs under LEADER include one municipality (19 LAGs), number of LAGs covering two neighboring municipalities is 12, three LAGs composed by three neighboring municipalities and one LAG included four neighboring municipalities.

Presently, at the local level, LEADER/CLLD is implemented through LAGs' activities and the CLLD strategy.

Table 2. CLLD funds disbursed across operational programmes (2018)

Programmes	**Budget for CLLD (million €)**	**ESIFs %**	**Share to total CLLD budget %**
Rural development programme	131.0	5% (EARDF)	43%
Operational programme "Innovation and competitiveness"	64.0	6% (ERDF)	21%
Operational Programme "Human Resource Development"	50.0	5% (ESF)	17%
Operational Programme Environment	19.5	2% (CF)	6%

Source: Information System for management and monitoring EU Funds (ISUN) and author's own calculations [13].

The number of LAGs is 71, including 117 municipalities, 1,646,588 inhabitants (23 percent of population) and 5 percent of the total territory [16]. The contribution to the budget of multi-funded CLLD is as follows: Rural Development programme is €131 million, operational programme "Innovation and Competitiveness" is €64 million,

operational programme "Human Resource Development" €50 million, operational programme "Environment"- €19,5 million, operational programme "Science, Education for Smart Growth" - € 40 million [13].

The highest share of financing for carrying out the multi-funded local strategies comes from the Rural Development programme. Practices have shown that integrated local development has a positive impact on local economies, job creation, and development of new and traditional economic activities outside of the primary production in the agriculture sector. The advantage is the possibility to combine various community needs (social, cultural, environmental and economic) and to gain access to different funds.

Harizanova. H., and Stoyanova, Z highlighted that LAGs and the creation of initiatives for starting and maintaining small business is important factor for the development and growth of rural areas [12]. The LAGs act as a kind of managing local bodies and as such they issue calls for proposals, evaluate projects and support beneficiaries in project implementation.

Some of results achieved by the applied integrated strategy (LEADER and CLLD) can be summarized as:

-Introduction of an integrated mono or multi-funded strategy to rural areas;

-Involvement of a variety of actors from businesses, non-profit associations;

-Creation of a new community institutional structure based on partnership and cooperation;

-Concentration of financial resources on the specific needs of the territory;

-Diversification of the economy in rural areas beyond the agriculture sector.

The difficulties of CLLD in implementing multi-funded strategy can be grouped in the following manner:

Administrative capacity – CLLD is a new approach and the LAGs do not have sufficient experience and knowledge in the project management and practical experience in implementation of integrated territorial strategies and planning the targeted investments. The administrative burdens stem from complicated administrative procedures and the existence of numerous operating and implementation rules within structural funds imposed by managing authorities. The fact that LAGs often involve partners who are unfamiliar with local economic development issues and funding per projects is limited, may lead to increase of the risk of political interference in the choice of eligible territories/strategies and project selection within the local strategy.

Governance – the coordination of projects under CLLD is well organized but as the process of approval strategies, projects verification and payments take time, which leads to increase of the opportunity and transaction costs. There are differences in the regulatory framework and guidance of ERDF, ESF, EAFRD (for instance, in terms of eligibility rules, eligible costs, project application requirements, criteria for project selection and assessment, financial control and audit, etc.) that limit the integration of funds. These differences create an obstacle for achieving the projects' objectives by the project beneficiaries and executing the projects on time.

Public-private cooperation – The municipalities play a leading role in establishing the LAGs. Some of the difficulties that have been encountered include low public awareness and understanding of the needs and the benefits of integrated territorial strategy and the importance of mobilizing potential beneficiaries as well as low levels of communications with stakeholders. Despite such difficulties the urban and rural municipalities have gained some experience in implementing both territorial integrated approaches.

The territorial approaches CLLD and LEADER concentrate investments to achieve greatest added value by decreasing economic and social disparities across rural and urban areas.

The descriptive analysis shows that the deviation of the main economic factors of the municipalities as a result of the implementation of the CLLD and LEDEAR approach (the results of descriptive analysis

are shown in Table 3). It also shows that municipalities which established LAGs and carried out the local territorial strategy indicators' value (the unemployment rate and the number of unemployed, the number of unemployed to 29 age and long term unemployed) is low than the municipalities which have not applied CLLD or Leader approach. The change in average income is positive in municipalities with LAGs, the average income is higher by 7.7 percent when compared to municipalities without LAGs. The standard deviation show that the rural municipalities have been brought closer to the level of urban municipalities (standard deviation is 3.5 percent) and the divergence between rural municipalities without LAGs and urban municipalities is larger (standard deviation is 10.5 percent).

The value of the economic indicators (net revenue of sales and output) of municipalities with LAGs is higher than for rural municipalities without created LAGs. The average difference of indicators net revenues of sales between municipalities with LAGs and municipalities without LAGs is 66.6 percent and the divergence in output's value is 68.7 percent. The positive effect of the local territorial strategies on small and less developed rural municipalities is obvious. The increase of the value of indicators (measuring the unemployment level) is modest in comparison to urban municipalities. Based on the results of the descriptive analysis one can infer that the economic and social development of the rural municipalities does not bring them closer to urban municipalities. It is important to point out that the LAGs strategy contributed to the improvement of the economic potential of rural municipalities, but the social effect is still less visible. This is due to the fact that LAGs promote small size projects focusing on development of micro enterprises in order to diversify the local economy.

Table 3. Descriptive analysis – results

		1	**2**	**3**	**4**	**5**	**6**	**7**
Rural municipalities (with LAGs)	Average Value	756	110	355	14	8,870	290,554	226,708
	Median	569	93	263	13	8,473	136,981	116,398
	Standard Deviation	652	103	403	8	2,299	369,777	299,833
	Standard Deviation (%)					26%	127%	132%
Rural municipalities (without LAGs)	Average Value	701	100	340	19	8,235	174,358	134,395
	Median	603	79	250	16	7,701	62,499	47,531
	Standard Deviation	522	82	320	13	2,340	314,312	250,191
	Standard Deviation (%)					28%	180%	186%
Urban municipalities	Average Value	2,969	432	599	6	9,198	6,070,192	3,478,376
	Median	2,166	306	398	6	8,877	1,623,772	1,143,413
	Standard Deviation	1,461	219	373	12	2,468	8,193,506	4,214,643
	Standard Deviation (%)					27%	135%	121%

Sources: NSI [18, 19] and author's calculation

Legend: 1–total number of unemployed; 2 –number of unemployed; 3–number of unemployed to 29 age,4-number of long-term unemployed; 5–unemployment rate; 6–the average annual income per person,7–net revenues from sales (thousand BGN); 8–output (thousand BGN).

CONCLUSIONS

In Bulgaria, most of the regions are lagging behind in their socio-economic development. The main reasons for that are the negative demographics trends, aging population and low economic activities. The CLLD is focused on specific sub-regional areas and the projects usually take place in the active rural areas. The measuring of the effects of local territorial strategies is based on descriptive analysis. They show the positive impact on economic environment of the rural municipalities which have introduced the local integrated strategies under LEADER/CLLD program. The territorial cohesion policy is useful and has a positive economic effect for small municipalities, which face various risks such as poverty and labor market isolation. The CLLD therefore is an effective mechanism for increasing diversification of sources of employment and income and providing support for micro and small enterprises and for promoting entrepreneurship. Despite the benefits of concertation of investments on the territories with specific needs, the economic and social divergences still persist and rural municipalities are lagging behind when compared to urban municipalities. In addition, there are still some rural and urban areas in Bulgaria which do not receive sufficient national and EU funding due to the fact that they are not considered attractive for investments.

The combination of the both integrated territorial approaches (bottom-up and top down) has advantages which decrease the depopulation in rural areas and ensure financial support for "white spots", i.e. settlements located in the peripheries of the cities, which have not received the grant up to now from the operational programme funded by ESIF. Combing CLLD and ITIs for the next programing period (2021-2027) would be beneficial for these areas as it would create the necessary conditions for stimulating economic activities and ultimately making these areas attractive for business development.

It is important to take into consideration the fact that Bulgaria has insufficient experience in implementing integrated territorial strategies at regional level, and there are still some difficulties when it comes to the coordination between the central government, managing authorities, regional bodies and project beneficiaries. The establishment of a common strategy for implementation of the territorial integrated approach and insisting on training of the administrative staff and improving the coordination between the various bodies and participants is therefore crucial for their successful execution.

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METHODOLOGICAL APPROACHES TO STRUCTURING AGRI-FOOD POLICY IN THE NATIONAL FOOD SYSTEM OF THE RUSSIAN FEDERATION

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Abstract

This paper aims to refine the theoretical basis of the strategic management arrangements in the development of the national food system in the Russian Federation. The authors consider the aspects of the existing state and conditions of operation, capacity building potential, food security issues, and the refinement of parameters of administrative influence based on the substantiation of the main principles of the agri-food policy. The article uses the methods of systematic and graphic analysis, as well as forecasting methods, to clarify the theoretical positions concerning the mechanism of strategic management of the national food supply system development in the Russian Federation. The results of the study allow the authors to conclude that in the formation of the food security system, it is necessary to carry out the transformation of the managerial impact on the united multi-sectoral functionally interacting sector of the country's economy.

Key words**:** *resource potential, regional differentiation, agri-food policy, food security, Russian Federation, methodological approach*

INTRODUCTION

The development of strategic management arrangements for food security based on the specifics of the national food system and prospective analysis warrants research into agri-food policies with a view to identifying the directions and priorities of development. Therefore, the object is primarily the state of the manufacturing potential in the described sector of the economy, issues related to food security, and development directions in line with the specifics of operation [1, 4].

Aspects of strategic management for food security have been widely addressed in research. However, there is no objective evaluation of the state of manufacturing potential in food security taking into account the specific aspects of the operation of the said sector.

Indian researchers A. Panghal, N. Chhikara, N. Sindhu, and S. Jaglan [8] approach food security through the lens of a production management system for food safety. They believe that the modern system of agriculture involving the use of machine-powered labor and advanced marketing fails to ensure food safety throughout food production. Moreover, a high incidence of digestive diseases highlights serious concerns over food safety. A major concern among researchers relates to unlabeled but patented genetically modified products available in the market. Amid globalization, government policies in some countries often overlook or discard the consequences for public health in food production while focusing on sustaining food supply chains. This paper offers a consideration of food security in the Russian Federation through the lens of management.

MATERIALS AND METHODS

The materials of this study include official figures from the Russian Federal State Statistics Service (Rosstat), our calculations, and analytical research materials provided upon formal requests as part of the research sponsored by the Ministry of Science and Higher Education of the Russian Federation.

In our research, we used the methods of systematic and graphic analysis, as well as the methods of modeling and forecasting of the development of Russian food security.

RESULTS AND DISCUSSIONS

The food security in the Russian Federation is regulated by numerous legislative acts, including the Doctrine of Food Security (2010) [5].

There are several specific features of the national food in the Russian Federation, which include the following [3, 7]:

-widespread geographic profile, as well as socioeconomic and natural and climatic differentiation of agriculture (there are 85 federal subjects in different natural and climatic zones and across the socioeconomic range);

-effect of regional differentiation by the state of the resource potential (the state and quality of natural and climatic, land, labor, and institutional and technology resources) manifesting in the levels of sufficiency and influence of regional subjects on raw materials production in the national food market, as well as the stability and competitiveness parameters (Table 1).

Table 1. Ranking of regions by federal districts of Russia by the relative weight of agricultural output in the national total, percentage in 2017

Federal district	Relative weight of the federal district	Number of regions in the group						Number of federal subjects
		From 0.1 to 1.0	From 1.1 to 1.5	From 1.6 to 2.0	From 2.1 to 3.0	From 3.1 to 4.0	From 4.1 and above	
1	2	3	4	5	6	7	8	9
Central	25.8	8	4	3	1	1	1	18
Northwest	4.9	8	-	1	-	-	-	9
Southern	16.2	3	2	-	1	-	2	7
North Caucasus	7.5	5	-	1	-	1	-	7
Volga	23.1	6	3	2	1	1	1	14
Urals	6.4	1	2	-	1	-	-	4
Siberia	12.7	6	2	3	1	-	-	12
Far East	3.4	9	-	-	-	-	-	9
	100.0	46	12	10	5	3	4	80

Note: The calculations were made excluding data on autonomous districts included in the regions.
Source: Calculations were made based on data provided by Federal State Statistics Service (www.gks.ru).

The issues of strategic management of development appear particularly relevant given the need to promote regional influence on the provision of the market with food products and creation of a sustainable food security system and to improve competitiveness in the global food market [6]. Enhancing production capacity in regional food systems and reducing the level of differentiation in the life quality of the regions will have a direct effect on the opportunities of the food market and an increase in the attractiveness of Russian agricultural products in the foreign markets.

The transformation of managerial influence into outcomes can be rendered in the following logical scheme [4]:

Stability → (sustainable development management system + stable operation management system) - management of objects.

Therefore, sustainability management involves the implementation of complex steps for comprehensive influence on the state of food resource potential elements of the national food system, which can be formally presented as the following process [2]:

$$S \rightarrow \frac{R_i \times Y_i}{W_i} \rightarrow S_n,$$

$$S \rightarrow R_i \times \frac{Y_i}{W_i} \rightarrow S_n,$$

where S is the basic state of the system;
S_n is the desired state of the system;

R_i is the food resource potential of the system;
Y_i is the institutional influence;
W_i is external influences.

$$Ri = [Ni \times Ci \times Ji\ ],$$

where Ri is resources;
Ni is natural capital;
Ci is man-made (produced) capital;
Ji is human capital,
where $Ji = Tec \times P$
Tec is the life expectancy of an economically active laborer;
P is the productivity of the individual, which, on average, corresponds to the per capita GDP.
Based on the principle of mutual correlation of factors in socioeconomic systems and considering the synergetic relation, which during the joint operation of elements, irrespective of the elements themselves, reinforces their total effect above the level of independent effects taken together, the above process can be formally presented as follows:

$$E(Ri \times Yi \times Wi\ ) > [E(Ri\ ) + E(Yi\ ) + E(Wi\ )].$$

Such an approach implemented in a system of strategic management measures helps to reframe the logical scheme into a pattern to ensure effect from focused managerial influence over the state of the national food system. It suggests that its efficiency can be positive under the following conditions. According to the universal law of transformation and accumulation of information accompanying the transformation of matter and energy (production process, economic operation or other form of control influence on the system), the amount of information generated in joint operation of control system elements is greater than the total of control influences of each individual element over the outcome. Further improvement of management arrangements in the development of the national food system is determined by the combination of influence factors over the efficiency of managerial input in line with the set objectives and observed challenges.

Among the reasons hindering the effectiveness of influence on the problems of the national food system, one can name the following [2, 9]:
-ineffectively functioning system of strategic planning of the national food system as a single economic sector and an object of interest of both internal and external trade;
-bimodal production structure of the agri-food sector of the economy as an established sector of large-scale agricultural production and poor development of small and medium forms of economic operation. The growing negative trends in rural population numbers (in terms of age and professional structure) contribute to a further change in the influence of the economic sector on the national food market in terms of the decrease of product volume in the market and the relative weight of the high-quality agricultural product;
-lack of efficient coordination arrangements between the federal and regional governance with various elements of the national food system;
-differences in the levels of the resource potential and the development of regional food systems;
-differentiation in the socioeconomic development of the Russian regions.
Ignoring the issues of further improvement of the material-technical infrastructure in the national food system (the data in the table show a considerable slowdown in the investment flow into the production facility structures) can potentially adversely affect the national cattle breeding (the volumes of cattle meat production), dairy production, production infrastructure, and sheep breeding.
Analysis of the regions by the level of changes in the production of gross agricultural output (Table 2) and the assessment of the organizational and economic bases reflecting their state and development prospects allow us to conclude the following.
The systematic approach based on the consideration of resource potential, production and consumption balances of food resources, financial support of program activities, the principles of strategic planning and the priority of strategic development directions of regional food system seems to be

the most appropriate. It allows forming a business structure that meets the requirements that will determine strategic options and identifying a set of development management practices involving federal, regional and household levels.

Table 2. Grouping of regions of the Russian Federation according to the level of changes in the production of gross agricultural output

Groups of regions in terms of changes in gross production	2016 to 2014	2017 to 2015
	Number of regions	
With a decrease in production	3	16
With an increase in production		
under 5.0%	4	16
5.1-10.0%	13	18
over 10.0%	61	31
Total number of regions	81	81

Source: Calculations were made based on data provided by Federal State Statistics Service (www.gks.ru)

As a result, the analysis of the current national food system allows to conclude that the reason behind the insufficient level of food security in terms of several products is related to the fact that the national food system has not been approached as a single multi-industry and functionally inter-operational sector of the economy commanding the production and processing of agricultural products and raw materials and supply of end products to the consumers.

This statement predicts the need for the application of the systematic approach to management strategy in the food market amid limited availability of certain types of resources in accordance with the prioritization and significance principles. The systematic approach here implies comprehensive influences exerted to address a complex problem, i.e. the establishment of an institutional economic model of the national food sector as a food production cluster within the food system. Accordingly, it is viewed as strategically important to address the processes enabling the development of all elements of the national food system, which we designate as the following development models in the regional subjects:

-management model of territorial and industry-specific systems (management strategy for regional food systems at the federal level);

-management model of functional and industry systems (development programs for regional agri-food structure and infrastructure complexes);

-management model of territorial and economic systems (enterprises, industries at the local (municipal) level);

-management model of socioeconomic development (food resources requirements or living standards at the individual level).

Modeling of food security provision in the framework of the strategic planning system must consider the complexity of the management object and includes the following:

-evaluation and analysis of the problem sectors in the regional food security system (ontological approach);

-forecasting the sequence of change in production food structures of the regional food systems.

In the existing models of management, the methodical approach to improvement and optimization of the territorial and sectoral structure normally involves:

-establishment of an economic operational complex in line with the existing scheme of distribution of manufacturing enterprises, development tasks, and analysis of influences over the market state (process approach):

-determining the amount of resources for development, allocation of resources (by priorities, industry and areas and in time), and management methods (imitation approach);

-performance analysis, review of options (cognitive approach).

CONCLUSIONS

The need to apply the described approach in managing the strategic development of the national food system and implementation of a resultant agricultural policy helps to comprehensively evaluate the state and identify existing problems of the sector. In the existing models of management, the methodical approach to improvement and optimization of the territorial and sectoral structure normally involves the establishment

of an economic operational complex in line with the existing scheme of distribution of manufacturing enterprises.

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THE CONSERVATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE: THE PERSPECTIVE OF PRODUCERS WHO ARE TRADING IN SIBIU AGRI-FOOD MARKETS

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Abstract

Building resilient rural areas or communities is one of the major goals of any strategy supporting food security for the future. Under these circumstances the major stakeholders are the people working in agriculture such as producers. In Romania, Sibiu county they can be landowners, custodians or non-formal land-loaning people dedicated for practicing agriculture. The scope of this article was to survey the awareness level regarding the value of genetic resources for food and agriculture of producers that are selling their agri-food products in Sibiu city. Based on the analysis of our results most of producers are of orthodox religion and are coupling the religious fests 'calendar to agricultural practices calendar. If they are aware about the value of old animal bred, they are not aware about the value of preserving landraces for more than 100 years in the same agro-ecosystem. About 15 crops species are among the best traded on the Sibiu market, but their genetic pools is much wider reaching up to 40 species in traditional gardening. The landowners are not ye associated at the commune level and therefore it is a great need to be supported at the local and county level by officials. A recognition of the history of importing genetic resources for the region is a must due to current failures in importing crops not suitable for very peculiar local conditions. Also, we recommend the adoption of the list of crops varieties traditionally cultivated in villages. The willingness of producers to be recognized for a potential network for on farm conservation should also be part of a process to be adopted an official list for on farm conservation of genetic resources in a bottom-up approach up to the national and European levels.

Key words**:** *producers, agri-food products, plant genetic resources for food and agriculture, landraces, local breeds, biodiversity conservation*

INTRODUCTION

Local varieties or local populations of crop plants as well as old races of animals have come to the attention of researchers more than 20 years ago as they are important gene pools for breeding [15; 16; 20] and gene banks [8; 17].From political point of view they ensured their entry into the future food security agenda and influencing the general agricultural practices management as well as conservation strategies for agricultural biodiversity [5; 7]. In Italy, some 14 years ago, it was a real movement in the central region for the recognition of the value of local crops varieties or landraces that further penetrated the regional commercial markets, also in line with the European regulatory framework [13; 14]. We mention that earlier stages of this process of institutional capacity building have been achieved without specific provisions from European legislation that started after 2008. Have been published a whole series of strategies on how genetic resources can be best preserved. The best strategy should aim a dynamic balance between *in situ* and *ex situ* conservation of all genetic resources on a cost-efficient basis, according to an evaluation on a four- or five-years analysis based on specific principles published some 40 years ago [1], and followed by new approaches [9; 13; 14]. Resilience of local communities is an old and a new topic that basically integrates the principles of sustainable development [18]. The authors believe that all members of rural communities potentially can best contribute to the development of local strategies as they will ensure the successful implementation of the promoted measures. These strategies provide innovative financial

mechanisms including incentives and, moreover, the communication landscape with business that is a must [3]. The main challenges are given and supported at the policy level as well as of the effects of climate change (i.e. risks and hazards). The scope of this article is to evaluate the willingness of a certain group of producers from Sibiu county that are selling their agri-food products in Sibiu city to be part of a county network dedicated to on farm conservation. A survey based on simple questionnaire was applied in order to reveal also their knowledge for landraces cultivation and old animal breeding. These results may further substantiate local decisions-taking regarding the general agricultural management in rural areas of Sibiu county, in order to ensure food security for the future based on resilient communities for South East Transylvania [2].

MATERIALS AND METHODS

Producers identification. During September (i.e. 2016, 2017 and 2018) it was possible to identify the origin of agri-food products during surveys conducted in the following agri-food markets: "Cibin", "Transilvania" and "Huet", all located in Sibiu city [19]. 114 producers from Sibiu county as farmers, small farmers and householders have been identified and answered a short questionnaire. The questionnaires were accepted by respondents and applied during Oct.-Dec. 2017 and 2018.

Fig. 1 Surveyed producers for Sibiu city are originating from the following communes: Alțâna, Bârghiș, Jina, Loamneș, Luduș Răşinari, Roșia, Sadu and Șelimbăr. Source: Modified map after https://ro.wikipedia.org/wiki/Fi%C8%99ier:Harta_jud_Sibiu.png.

Places of investigations. The residence place of producers located in the following communes: Alțâna, Bârghiș, Jina, Loamneș, Luduș Răşinari, Roșia, Sadu and Șelimbăr (Fig. 1). They represent only 20% of the producers identified during two years of surveying.

Data analysis. Provided data during the survey have been statistically analysed.

RESULTS AND DISCUSSIONS

Producers and land. Among 114 respondents 84.62% are landowners, 11.54% custodians and 3.85% work the loan land without official documents. This high percentage of landowners raise the question why they are not organized in an association for representing their rights in different fora with authorities. Such an association would further support their economic interest for producing agri-food products [22]. The distance towards the main roads varies between 2 km up to 30 km and the fertility of soil range between medium to fertile with good exhibition towards the environmental factors. As far the distance is the hardest is to sell their products. From religious point of view between 60% (Bârghiș) and 100% they are orthodox (Jina) and agricultural practices are still closely related to the religious fests' calendar for all producers. 37% were women among producers and among these 84% were householders rather than farmers. Family members varied for a family between 8 (i.e. 6 families) and 2 (12 young families) and the majority 68.2% varied between 5 and 4 members. The family members can support further the farmer occupation job for the future. The cultivated surface area varies between 400 ha (i.e. Jina) down to 0.5 ha (i.e. householders). The majority of producers are working a land surface between 15 and 20 ha (i.e. 72.5% of the respondents). 28.57% are practicing intensive agriculture on large surfaces (i.e. down to 20 ha). 57.14% are practicing organic agriculture and 14.29% are practicing classic agriculture.

Seeds analysis. The majority of producers, 43.48% developed mixed farms (livestock and crops) and only 13.05% are crops farms and

gardening. Among these farmers (i.e. 86.75%), over 68.42% are using certified seeds for commercial production especial for cereals, maize and potatoes. A percentage of approx. 30% of respondents said they had seeds of local varieties and this is the case of mountain areas potato from Rășinari and cucumber from Sângătin. 80% of producers for vegetables are saving seeds and 20% are buying from acquaintances or markets. This is the situation for beans, tomatoes, pepper, egg plants. Producers are not aware about the concept of native landraces [23] and this can be dramatic for loosing genetic pools for important vegetables or cereals that may be the subject of breeding programmes in our country and Europe. Almost all producers tried exchanging local seeds with other producers from other counties based on the seeds exchange network highly promoted in the country. However, the risk of entering allochthonous landraces in the region is high. Therefore, we consider that during this project it was also possible to underline the importance of local landraces originating from their own lands and gardens and inherited from their ancestors. Under these circumstances we may consider that 30.77% of the saved seeds could be considered either native (cultivated for 100 years in the same agroecosystem) such as certain landraces of beans, or creoles (cultivated for less than 50 years in the same agroecosystem) since they are older than 30 years, the remainder being local allochthone seeds with a different origin (newly introduced local seed). Respondents considered local varieties as more resistant towards dry conditions (27.78%) and at least 44.44% felt they wanted to perpetuate them in order to preserve their family traditions. 73.07% of respondents considered that they are committed to continue the preservation of local genetic resources by cultivating them on small surfaces (i.e. gardening). We mention that 12 crops species are cultivated into the field, 9 in gardens and 5 in both, by taking into considerations only the species that are part of the trading system (i.e. *Triticum aestivum, T. durum, Aegilops speltoides*, *Zea mays*, *Hordeum vulgare*, *Avena sativa*, *Medicago sativa*, *Solanum tuberosum*, *Brassica oleracea*, *Solanum melongena*, *Cucumis sativus*, *Lycopersicon lycopersicum*, *Alium cepa*, *Alium sativa*, *Capsicum annuum*). All producers are attentive for characteristics of fruits (57.14%) or seeds (42.86%) for saving seeds. Also, for hem are important the shape, size, colour, taste and the complete lack of pesticides (11.11%).

On farm conservation willingness. On farm conservation is one of the most efficient economic alternatives for biodiversity conservation [6] and yet it is not implemented in Romania or other European member states. Different reasons are substantiating this delay in creating a European framework for their recognition into a real network [9]. 90% of respondents are aware that it might be possible that landraces and local breeds to disappear very soon, and 81.25% of all of them want to be part of an officially recognized network for the conservation of local varieties and breeds. An association of these producers would become more effective on the way of on farm conservation network recognition. Among these producers some are farmers and some are only householders and only 55% of all respondents are practicing total mechanized harvesting. This is the case for farmers and not for householders. Under these circumstances a relevant study was published for central Italy having as a case study Brassica family for crops species [11, 14, 21].

Further data relevant to the need for recognition of on farm / on household conservation status for landraces and old animal breeds will be presented.

In-house needs supplied by farming. Of all respondents 93% are covering all their needs as agri-food products from their own farms for all year around (i.e. 365 days). This should be a normal situation for the sustainable agricultural practices in all agricultural ecosystems and recognized today as a real challenge [4]. Exceptions are small householders dedicated either for vegetables cultivation either for livestock breed. Only between 6% and 16.34% of the ingredients of the basic courses originate outside Sibiu County (i.e. tomatoes, pepper, egg plants, potatoes). Without awareness the households

of Sibiu County, apply the central principles of circular economy but most of them are stack in the rural areas [12]. Resources from spontaneous flora are often consumed during the season: ramsons, nettles, spruces, common bird's-foot trefoil, cress, sheep's sorrel, broad grass, plus edible mushrooms collected from natural and seminatural areas. Among the old breeds of domestic animals, we mention as frequent used: 'Țurcană'- sheep, 'Bazna'- pig, 'Mangaliţa'- pig and 'Bălţata Românească'- cattle, long-time ago recognized for their value [20].

On farm conservation perspectives. The European legislation defines *in situ* conservation as the place where local varieties have naturalized and is assimilated to the farm term for cultivated plants. No indications are given as to how recognition of holdings / owners of local varieties can be organized. Sibiu has the chance to develop for the first time officially in Romania this concept to ensure the implementation capacity of the European regulations on the conservation of local varieties.

At the local level, with the support of local councils it can be developed official lists of species and varieties traditionally cultivated in their communes. In this regard a network of producers may further organize meeting with officials for defining their own genetic resources. It is based on principles already substantiating generally bottom - up approaches strategic development. The purpose of this official list is to raise awareness at local level of the significance of long-term food security for maintaining *on farm* or *on household* of landraces and old breeds considered valuable resources worldwide for their genetic basis in research, breeding and food security. In this regard, the tax conscription of Transylvania published in 1750, reveals official lists comprising the main species of crop plants found in villages [10]. Many of these (the potato) were still gardening crops and in less than 100 years they have conquered cultivation in the field [2]. The process was slow, associated with local understanding of their usefulness as food and feed. This process was lost during time and it is valuable in terms of adaptation of genetic resources to new environment. Testing first in small plots]n case of framers is lost in Romania. However, the national network of seed testing may provide a free access to new genetic resources, but however, local climate may be different compared to testing centres and the dramatic loss of production cannot be estimated for all types of climate in the country [1]. It is relevant that each owner of arable land (householder and farmer) should be aware of the inestimable value of local native varieties grown in their own household or of old farmed breeds for more than 100 years. Also, each landowner (householder and farmer) understands the unwanted effect of introducing into the culture of alien, exotic varieties if they are not accepted by the community. The community of arable landowners represented by the City Hall has the right to decide on the acceptance or rejection of the cultivation of alien varieties and hybrids on the basis of the assessment of the genetic contamination risks of the local genetic resources pool, and further for ensuring food security for long term.

Producers know the intrinsic value of these valuable genetic resources through instrumental values (i.e. take-over and perpetuation from generation to generation) as well as their unicity as food resources. Their value can be defined collectively also as instrumental values. Those values are attributed to any resources that can be integrated into economic needs at the social level. As a result, local native and creole varieties can be well defined and understood not only by conservationists but especially by the society in which they carry out their activity or by the stakeholders to promote them.

In case of local authorities, through the Local Councils, they need further to support the coherent and consistent integration of conservation measures applied in agricultural policies for supporting food security under the impact of climate change from the village level, on a case by case basis and therefore there is an urgent need for the adoption of official decisions regarding the following:

(1) the Official List of species and varieties / hybrids of plants and animal breeds

historically existing in the localities. This measure is important in order to avoid the cultivation of plants that cannot be adapted to local pedo-climatic conditions in our country. Here we present the example of Paulovnia's unsuccessful cultivation in Brad commune, Sibiu county. On the other hand, the loss of certain crops (e.g. millet) may be again of interest today due to demand in the food market. For the future, the revitalization of neighbourhoods would support integrated agricultural management for rural communities by compacting crops plots in the same area and reducing costs.

(2) the Official List of species and varieties / hybrids of crops and animal breeds existing on the farm at Sibiu County and the distribution map thereof. The measure will support future strategies for ensuring food security in Sibiu County under conditions of climate change. They will also be benchmarks for harmonizing environmental policies with regional agricultural and economic policies;

(3)Council Decision on the procedure for approving the long-term integration of new genetic resources (plant varieties and hybrids of plants and animal breeds). Such a measure will especially support communication to rural communities about the latest news, vulnerabilities and risks. The measure should be accompanied by recommendations for rural communities;

(4) Council Decision on the list of landowners applying traditional agricultural measures, use local varieties and breeds of Romanian animals in the household. The measure is important for knowing at county level the situation of cultivation and preservation on the farm of the old cultivar varieties, their production and the potential of marketing traditional products to the agri-food markets or stakeholders such as the hospitality industry interested in culinary tourism. The magnitude of the presence of these resources may determine cooperation with the Sibiu varieties testing centre to initiate the recognition of local varieties for Sibiu County. Sibiu gastronomic region can bring for the first time the official recognition of the presence of local varieties and old races of Romanian animals in the households of people. The measure is justified by the results of the interview for the producers.

CONCLUSIONS

Based on the analysis of these results it can be considered that generally producers from Sibiu county are dedicated for continuing agriculture activities. However, they are not aware yet about the value of plant genetic resources as landraces even they are aware about the old animal bred. Even the most of producers are landowners they are not associated to develop common practices for the support of resilient villages or communes facing climate change risks and hazards. Local and County Councils are not yet involved in the real support of the conservation and sustainable use of rural resources such as genetic resources for food and agriculture. They need to address and substantiate their future decisions on the agricultural history of the place and to support the cooperation between all producers in a village or commune.

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THE MELLIFEROUS POTENTIAL OF THE FLORA IN THE GUȘTERIȚA LOCALITY, SIBIU COUNTY, ROMANIA

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Abstract

The locality Guşterița, today a neighborhood of Sibiu city, belongs to the well studied place concerning the botanical point of view, with almost complete floristical inventories. Our study has a purpose to identify the main melliferous plants in the Guşterița locality and its surroundings. We want to complete my researches about the melliferous base of the Sibiu county, in order to turn to the best account of the melliferous resources in this area.The following methods have been applied to achieve the purpose: the study the data from the specialized literature of the botanists who have done researches in this area, direct observations in the field, the collecting of the botanical material and its identification in the laboratory. The result of the researches consists in the compiling list of the melliferous species in this area. They were identified 43 plants families and 181 melliferous species from the spontaneous and subspontaneous Flora with obvious implications in the the beekeeping.The melliferos resources of this area were grouped into four groups after the point of view of the melliferous weight.The knowledge of the floristic potential in Guşterița represents the key to the success for the beekeeping in Sibiu county.

Key words**:** *Guşterița, beekeeping weight, melliferous plants*

INTRODUCTION

The Gods, in a moment of divine grace, created the honey bees „for the sake of the man"[18]. Darwin sensed the honey bees, path in their 100 milion years of existence.

The human fascination about honey bees was also supported by the fact that the product of bees, honey, was the only one sweetener in human nutrition. This fascination diminished its attractiveness because of the imports of sugar cane from the New World into Europe.

Honey, this complete basic element was a part of the food of the Gods. Zeus himself was fed, as a baby, with honey and goat-s milk.

Greek mythology records the family Melisus, the honey man, with his daughters, the nymphs Melissa (the Bee Queen) and Amaltea (the Goddess Capra) that have fed Zeus immediately after his birth by Rheea [9].

An ancient Greek mith said that the first temple, of the five built, ab initio, at Delfi, was made of beewax and it was worshiped to the Earth Goddess in the hypostasis of a Bee [8].

The Paleolithic cave paintings also highlight the close relationship between man and bee. There are endless researches, works, studies dedicated to the bees, from the ancient times until the present day. Aristotel left us the extensive studies in his books, such as „Animal History". Plinius the Elder gathered in his encyclopedic work „Naturalis Historia" all the knowledges existing at that time about bees.

Herodotus gave us an interesting and somewhat surprising information: „ The land beyond water (Ister, Danube) can not be easily broken because of the crowd of bees ". Xenophon confirms: „ The food of Getas consists primarily of honey, vegetables, simple or cooked milk and vey little meat, because the faith in Zamolxis stopped them [10].

The bee has never lost its fascination for man. The Ethology, a science that deals with the study of the animal manifestations, has been keenly concerned with the enigmatic manifestations and states of the bees world. The so called „ the bees dance" considered a fantastic ritual, full of mystery has been

unravelled by the researcher Karl von Frisch. He drawed out of its spfere of magic, concluding that „the dancing bee" is nothing else but an informational attempt in the bees effort for guidance to the melliferous locations. Karl von Frisch received the Nobel Prize for his discoveries [1].

The researches has shown that the flowering plants, appeared 245- 200 million years ago. About around 100 million years they were spread over almost the entire globe. The bees have evolved simultaneously with the flowering plants. The key to success of this symbiosis was the necessary pollen both for the bees and also for the plants reproduction. [11]. The importance of pollinating insects in plant wool has been debated over time by different naturalists, among them bees and butterflies playing an important role. Studies and research related to the importance and evolution of lepidopteran populations in the hills of Gușterița [24] and in the surroundings of Sibiu have been carried out over time by the Sibiu saxons, but there are also more recent studies in recent years [25].

Over time there have been studies on the importance and beneficial qualities of honey. Physico-chemical analyzes revealed the composition and content of honey, which is strictly dependent on pollen and nectar of flowers [12,13].

The purpose of our research consists in identification of the melliferous flora from Gușterița and its surroundings, Sibiu county. The data obtained were corroborated with th data from the specialized literature about the studied flora of the area.

MATERIALS AND METHODS

The investigations were carried out in Gușterița, a Saxon settlement that is currently included in the area of the Sibiu city, which is in full expansion. The area of Gușterița comprises meadows, forests of acacia, alder, bushes, schrubs and orchards.The study of the melliferous flora was carried out between the years 2012-2018, from point of view theoretical and practical, on the following levels:

- the use of information from the specialized literature,
- the direct observation in the field,
- the collecting of the melliferous plants in the area and the identification of the plants in laboratory.

RESULTS AND DISCUSSIONS

An important condition for the growth and the profitable maintenance of the bees families is the knowledge of the melliferous plants in the area. Gușterița is a part of the localities in Sibiu county, that have been well investigated under the botanical aspect, with an almost complete inventory of the flora [1, 4, 5, 20, 21, 22]. The research of the potential of the flora in this area led to a number of 927 species of plants, of which we have identified 181 species of melliferous plants.

In order to identify the species of this flora, we have been used a number of resources from the speciality literature [2, 7, 14, 15, 16, 17, 23].

The result of our study is the elaboration of the floristic list of the melliferous plants and the determination of the beekeeping weight for each species [3, 6, 19]. (Table 1).

Table 1. The melliferous potential of the flora from the locality Gușterița and its surroundings.

Nr.crt	Family	Species	Beekeeping weight
1	*Berberidaceae*	*Berberis vulgaris* L.	Medium
2	*Aristolochinaceae*	*Aristolochia clematitis* L	Medium
3	*Ranunculaceae*	*Adonis vernalis* L.	Medium
4		*Anemone nemorosa* L.	Medium
5		*Anemone ranunculoides* L.	Medium
6		*Anemone sylvestris* L.	Medium
7		*Clematis vitalba* L.	Medium
8		*Helleborus purpurascens* W.etK.	Medium
9	*Papaveraceae*	*Chelidonium majus* L.	Little
10		*Corydalis solida* (L.) Sw.	Medium
11		*Papaver dubium* L.	Medium
12		*Papaver rhoeas* L.	Medium
13	*Fagaceae*	*Quercus petraea* (Matt.) Liebl.	Medium
14		*Quercus robur* L.	Medium
15	*Corylaceae*	*Corylus avellana* L.	Medium
16	*Caryophyllaceae*	*Silene vulgaris* (Mnch.) Garke	Large
17	*Polygonaceae*	*Polygonum aviculare* L.	little
18		*Polygonum hydropiper* L.	Medium
19	*Rosaceae*	*Crataegus monogyna* Jacq.	Medium
20		*Malus pumila* Mill.	Medium
21		*Pyrus communis* L.	Medium
22		*Prunus domestica* L.	Medium
23		*Prunus avium* L.	Medium
24		*Prunus cerasus* L.	Medium
25		*Filipendula vulgaris* Mnch.	Little
26		*Fragaria vesca* L.	Little
27		*Fragaria viridis* Duch.	Medium
28		*Malus sylvestris* (L.) Mill.	Medium
29		*Potentilla alba* L.	Little
30		*Potentilla anserina* L.	Little

31		*Prunus spinosa* L.	Medium
33		*Prunus tenella* Batsch.	Medium
32		*Rosa canina* L.	Medium
33		*Rubus caesius* L.	Medium
34		*Sorbus torminalis* (L.) Crantz	Medium
35	*Fabaceae*	*Amorpha fruticosa* L.	Medium
36		*Robinia pseudoacacia* L.	Very large
37		*Galega officinalis* L.	Little
38		*Lathyrus tuberosus* L.	Medium
39		*Lotus corniculatus* L.	Medium
40		*Medicago falcata* L.	Medium
41		*Medicago lupulina* L.	Medium
42		*Medicago sativa* L.	Medium
43		*Melilotus officinalis* (L.) Pall.	Medium
44		*Onobrychis arenaria* (Kit.) Ser.	Medium
45		*Onobrychis viciifolia* Scop.	Large
46		*Trifolium campestre* Schreb.	Medium
47		*Trifolium hybridum* L.	Medium
48		*Trifolium medium* L.	Medium
49		*Trifolium montanum* L.	Medium
50		*Trifolium ochroleucon* Huds.	Medium
51		*Trifolium pannonicum* Jacq.	Medium
52		*Trifolium pratense* L.	Medium
53		*Trifolium repens* L.	Large
54		*Vicia cracca* L.	Little
55		*Vicia grandiflora* Scop.	Medium
56		*Vicia hirsuta* (L.) S.F.Gray	Little
57		*Vicia pannonica* Cr.	Medium
58		*Vicia sativa* L.	Medium
59		*Vicia villosa* Roth.	Medium
60	*Lythraceae*	*Lythrum salicaria* L.	Medium
61	*Onagraceae*	*Chamaenerion angustifolium* (L.) Scop.	Large
62		*Epilobium hirsutum* L.	Medium
63		*Oenothera biennis* L.	Little
64	*Thymelaeaceae*	*Daphne mezereum* L.	Medium
65	*Cornaceae*	*Cornus sanguinea* L.	Medium
66	*Celastraceae*	*Euonymus europaea* L.	Medium
67	*Rhamnaceae*	*Frangula alnus* Mill.	Medium
68		*Rhamnus cathartica* L.	Medium
69	*Aceraceae*	*Acer campestre* L.	Medium
70		*Acer pseudoplatanus* L.	Medium
71	*Rutaceae*	*Dictamnus albus* L.	Little
72	*Geraniceae*	*Geranium pretense* L.	Medium
73	*Linaceae*	*Linum austriacum* L.	Medium
74		*Linum flavum* L.	Medium
75		*Linum hirsutum* L.	Medium
76	*Apiaceae*	*Carum carvi* L.	Medium
77		*Chaerophyllum aromaticum* L.	Little
78		*Daucus carota* L.	Medium
79		*Eryngium campestre* L.	Medium
80		*Eryngium planum* L.	Medium
81		*Heracleum sphondylium* L	Little
82		*Pastinaca sativa* L.	Medium
83		*Pimpinella saxifraga* L.	Little
84	*Tiliaceae*	*Tilia cordata* Mill.	Very large
85		*Tilia platyphyllos* Scop.	Very large
86	*Malvaceae*	*Althaea cannabina* L.	Little
87		*Althaea officinalis* L.	Little
88		*Althaea pallida* W. et K.	Little
89		*Lavatera thuringiaca* L.	Medium
90		*Malva pusilla* Sm.	Little
91		*Malva sylvestris* L.	Little
92	*Violaceae*	*Viola ambigua* W. et K.	Medium
93		*Viola canina* L.	Medium
94		*Viola odorata* L.	Medium
95	*Brassicaceae*	*Barbaraea vulgaris* R. Br.	Medium
96		*Brassica elongata* Ehrh.	Medium
97		*Brassica nigra* (L.) Koch	Large
98		*Brassica rapa* L. ssp campestris (L.) Clapham	Large
99		*Cardamine pratensis* L.	Little
100		*Crambe tataria* Sebeok.	Little
101		*Hesperis matronalis* L.	Little
102		*Lunaria annua* L. ssp. annua	Medium
103		*Raphanus raphanistrum* L.	Medium
104		*Sinapis alba* L.	Large
105		*Sinapis arvensis* L.	Medium
106	*Resedaceae*	*Reseda lutea* L.	Medium
107	*Salicaceae*	*Salix alba* L.	Large
108		*Salix caprea* L.	Large
109		*Salix cinerea* L.	Large
110		*Salix fragilis* L.	Medium
111		*Salix purpurea* L.	Medium
112	*Cucurbitaceae*	*Bryonia alba* L.	Medium
113	*Primulaceae*	*Primula veris* L.	Medium
114	*Gentianaceae*	*Centaurium erythraea* Rafn.	Medium
115	*Apocynaceae*	*Vinca herbacea* W. et. K.	Little
116		*Vinca minor* L.	Little
117	*Solanaceae*	*Datura stramonium*	Little
118		*Hyoscyamus niger* L.	Little
119	*Convolvulaceae*	*Calystegia sepium* (L.) R.Br.	Medium
120		*Convolvulus arvensis* L.	Medium
121	*Boraginaceae*	*Anchusa officinalis* L.	Medium
122		*Cerinthe minor* L.	Medium
123		*Cynoglossum officinale* L.	Medium
124		*Echium vulgare* L.	Little
125		*Pulmonaria officinalis* L.	Medium
126		*Pulmonaria mollis* Wulf.	Medium
127		*Symphytum officinale* L.	Medium
128	*Verbenaceae*	*Verbena officinalis* L.	Medium
129	*Lamiaceae*	*Ballota nigra* L.	Medium
130		*Calamintha clinopodium* Spenn.	Little
131		*Chaiturus marrubiastrum* (L.) Rchb.	Medium
132		*Glecoma hederacea* L.	Medium
133		*Glecoma hirsuta* W. Et K.	Medium
134		*Lamium album* L.	Medium
135		*Leonurus cardiaca* L.	Medium
136		*Marrubium vulgare* L.	Medium
137		*Melittis melissophyllum* L.	Medium
138		*Mentha longifolia* (L.) Nathh.	Medium
139		*Mentha piperita* L.	Medium
140		*Nepeta nuda* L.	Medium
141		*Origanum vulgare* L.	Medium
142		*Phlomis tuberosa* L.	Medium
143		*Prunella grandiflora* (L.) Jacq.	Medium
144		*Prunella vulgaris* L.	Medium
145		*Salvia nemorosa* L.	Medium
146		*Salvia nutans* L.	Medium
147		*Salvia pratensis* L.	Medium
148		*Salvia verticillata* L.	Medium
149		*Stachys annua* L.	Large
150		*Stachys germanica* L.	Medium
151		*Stachys recta* L.	Medium
152		*Stachys sylvatica* L.	Medium
153		*Teucrium chamaedrys* L.	Medium
154		*Thymus glabrescens* Willd.	Medium
155	*Plantaginaceae*	*Linaria vulgaris* Mill.	Medium
156	*Orobanchaceae*	*Pedicularis comosa* L.	Little
157	*Scrophulariaceae*	*Scrophularia nodosa* L.	Medium
158		*Verbascum blattaria* L.	Medium
159		*Verbascum chaixii* Vill.	Medium
160		*Verbascum lychnitis* L.	Medium
161		*Verbascum nigrum* L.	Medium
162		*Verbascum phlomoides* L.	Medium
163		*Verbascum phoeniceum* L.	Medium
164	*Rubiaceae*	*Galium verum* L.	Little
165		*Viburnum opulus* L.	Medium
166	*Valerianaceae*	*Valeriana officinalis* L.	Medium
167	*Dipsacaceae*	*Cephalaria radiata* Griseb. et Schenk	Little
168		*Cephalaria uralensis* (Murr.) Roem. et Schult.	Medium
169		*Dipsacus laciniatus* L.	Medium
170		*Scabiosa ochroleuca* L.	Medium
171	*Asteraceae*	*Arctium lappa* L.	Medium
172		*Arctium tomentosum* Mill.	Medium
173		*Aster amellus* L.	Medium
174		*Bellis perennis* L.	Medium
175		*Carduus acanthoides* L.	Medium
176		*Centaurea scabiosa* L.	Medium
177		*Cichorium intybus* L.	Medium
178		*Cirsium arvense* (L.) Scop.	Medium
179		*Cirsium canum* (L.) All.	Medium
180		*Inula britanica* L.	Little
181		*Taraxacum officinale* (L.) Weber ex F.H. Wigg	Medium

It is known that the life of bees, both in the larval and adult stages is closely related to the plant world. In our country they have been identified 398 species of melliferous plants. [17]

In Gușterița, the melliferous resources belong mainly to the spontaneous flora. We identified 181 species of melliferous plants that belong to 43 botanical families.

The best represented families are: *Lamiaceae* with 26 species, *Fabaceae* with 25 species, *Rosaceae* with 17 species, *Asteraceae* and *Brassicaceae* with 11 species, each of them, *Apiaceae* with 8 species, *Boraginaceae*, *Scrophulariaceae* with 7 species each of them, *Ranunculaceae* with 6 species, *Malvaceae* with 6 species and *Salicaceae* with 5 species.

The families represented by a small number of species are: *Papaveraceae* and *Dipsacaceae* with 4 species each of them, *Onagraceae*, *Linaceae* with 3 species each; *Fagaceae*, *Polygonaceae*, *Rhamnaceae*, *Aceraceae*, *Tiliaceae*, *Apocynaceae*, *Solanaceae*, *Convolvulaceae* and *Rubiaceae* with 2 species per family.

Many families are represented only by a single species: *Berberidaceae*, *Cornaceae*, *Corylaceae*, *Primulaceae*, *Lythraceae*, *Celastraceae*, *Rutaceae*, *Resedaceae*, *Cucurbitaceae*, *Gentianaceae*,*Verbenaceae*, *Plantaginaceae*, *Orobanchaceae* and *Valerianaceae* (Fig.1, Fig.2).

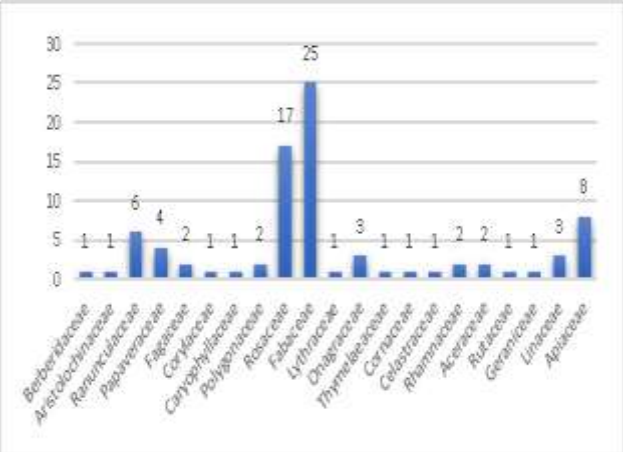

Fig. 1. The numerical abundance of the species included in the melliferous plants base in Gușterița.
Source: Own design.

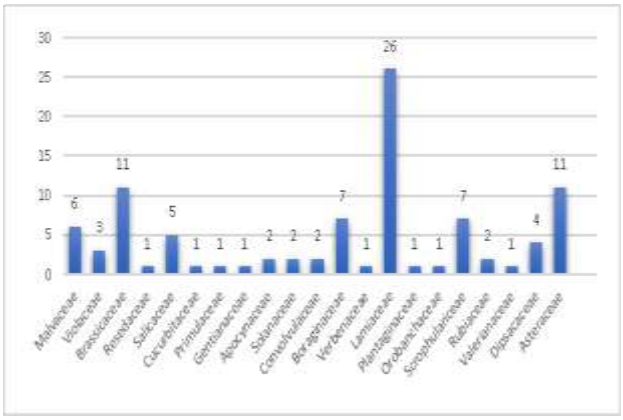

Fig.2. The numerical abundance of the species included in the melliferous plants base in Gușterița (continuation).
Source: Own design.

The ensuring a habitat rich in wild flowers comes to support the main pollinator in the area, *Apis mellifera carpatica* L. (the Carpathian bee) which has been formed under the specific conditions of climate, relief and melliferous plants base in our country. To place the bees families in Gușterița on the beekeeping hearths, located in an area with a high biodiversity of the melliferous plants, has a result the obtaining of a good honey harvest and the maintaining a favourable biological balance for the living bees.

The natural harvesting resources are extremely important because they are directly related to the beekeeping production.The 181 melliferous plants species of the investigated area could be distributed in the following four groups, after their beekeeping weight:

- Three species have been identified with a very large economical beekeeping weight: *Robinia pseudoacacia* L., *Tilia cordata* Hill., and *Tillia platyphyllos* Scop. They represent 3% of the total of the melliferous species.
- 11 species have a large economical beekeeping weight: *Silene vulgaris* (Mnch) Garke, *Onobrychis viciifolia* Scop., *Trifolium repens* L., *Chamaenerion angustifolium* (L.) Scop., *Brassica nigra* (L.) Koch, *Brassica rapa* L. ssp. *campestris* (L.) Clapham, *Sinapis alba* L., *S. caprea* L., *S. cinerea* L., *Stachys annua* L. These 11 species represent 6% of the melliferous species total.
- With a medium economical beekeeping weight is the best represented category. These

totalized 135 species which represent 74% of the total analized species (Table 1).

- The category with a low economical beekeeping weight includes 32 species which represent 18% of the honey resources of the area (Fig. 3).

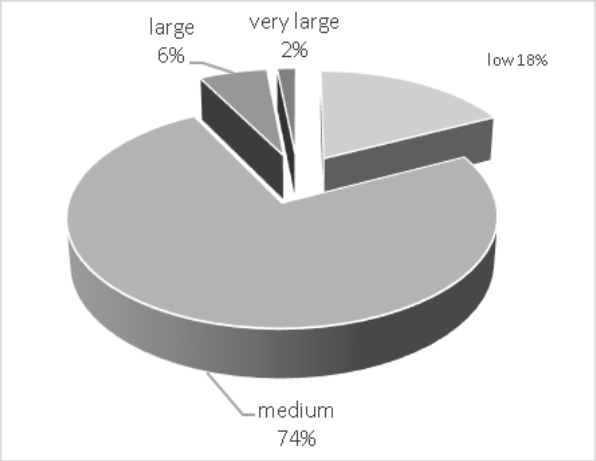

Fig. 3. The economical beekeeping weight of the melliferous plants species in the area of Gușterița
Source: Own design.

The melliferous species in the studied area have an economical- beekeeping weight that is divided into four categories: very large (2%), large (6 %), medium (74%) and little (18%).

On observe that the most important categories (very large, large and medium) represent 80% of the melliferous flora of the area, that demonstrate that the studied zone has a high beekeeping potential that can support the development of the beekeeping. (Photo 1)

Photo 1. Beekeeping located in Gușterița area
Source: Original.

CONCLUSIONS

After the botanical classification, in the flora of Gușterița, there are 927 cormophyte species, of which 181 species (19,52%) have a melliferous potential. They were grouped into 43 botanical families. The best represented from this point of view are Lamiaceae (26 sp.), Fabaceae (25 sp.) and Rosaceae (17 sp.)

Due to the large number of the valuable melliferous species, the plants in the area represent an important economical beekeeping factor that means production yields. Species with very large (2%), large (6%), medium (74%) and little (18%) beekeeping weight have been identified.

Because the melliferous potential of the flora in this zone is found in 80% in the first three categories with economical-beekeeping value, demonstrate that Gusterita is an area favourable for the beekeeping, ensuring the quality of honey produced in this area and its diversity.

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THE IMPACT OF BETTER GOVERNANCE ON FOREIGN PORTFOLIO INVESTMENT (FPI) IN AGRICULTURE

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Abstract

The FPI inflows are very critical for growth of agriculture sectors in developing economies. The objective of this research is to examine the association of different governance indicators with inflows of FPI in Pakistan's agricultural sector during 2005 to 2017 through applying OLS regression technique. The research findings depict that variables of governance index and GDP positively affect FPI, whereas, variable of inflation negatively influence FPI inflows in agriculture sector. Thus, it is essential to improve governance variables for strengthening trust level of foreign investors and increasing inflows of FPI in Pakistan's agricultural sector.

Key words**:** *Governance indicators, FPI, Inflation, GDP, Agriculture sector, Pakistan*

INTRODUCTION

The FPI involves the investment in stocks, bonds or money market instruments for shorter time period in foreign country. Because of its short term nature, it provides opportunity for investors to take advantage of favorable interest rate and exchange rate for buying and selling the security. It is an investment in the foreign secondary market and its purpose is to obtain higher return. This task is completed by passive or active investment strategies in financial markets. It improves liquidity position of host economy and also helps to increase the foreign reserves that result in stability of exchange rate. Firstly, the foreign portfolio investment (FPI) is affective for obtaining higher return and decreases risk through international diversification. Secondly, it performs a significant part in host country's economic growth. Thirdly, it encourages investment of new funds in the country due to which investment level would increase.

The FPI is one of the crucial capital inflows and in current economic conditions, it is extremely important as the market risk is very high due to instable political conditions, and the foreign investors are avoiding investment in Pakistan, therefore, foreign investors can be attracted to invest in Pakistan through FPI. Though, it is a shorter time period investment but it may be useful for Pakistan in attracting overseas investors. Unfortunately, the present conditions of Pakistan's markets are unstable. Economists suggest that stock exchange is an economy's indicator and stock market of Pakistan is in deep crisis.

Table 1. FPI inflows in Pakistan (in Million Dollars)

Year	Portfolio Investment
2001-02	-10.00
2002-03	22.00
2003-04	-28.00
2004-05	153.00
2005-06	351.00
2006-07	1,820.00
2007-08	19.30
2008-09	-510.30
2009-10	587.90
2010-11	344.5
2011-12	(46.9)
2012-13	119.5
2013-14	622.8
2014-15	917.3
2015-16	(319.7)
2016-17	(512.8)
2017-18	(240.7)

Source: Own calculation and design based on the data provided by [17]

Table 1 depicts that FPI has increased to $1,820 million in year 2006-07 from previous value of ($10) in year 2001-2002. Then it started decreasing and reached at ($46.9) in year 2011-12 and then again started increasing and reached at $917.3 in year 2014-15. Then again it started to decrease and reached at ($240.7) in year 2017-2018.

The Pakistan's agricultural sector is one of the most significant sectors because it offers millions of employment opportunities, has significant contribution in GDP, satisfies domestic food demand, contributes heavily in exports of commodities, increases foreign reserves and ultimately leads towards higher economic growth. The Pakistan has exceptionally attractive environment for foreign investors particularly in agricultural sector as Pakistani government has permitted 100% equity investment in this sector. But unfortunately, Pakistan's agricultural sector is also not able to attract foreign investment due to poor governance structure, corruption, security conditions and instable political conditions. Therefore, it is extremely important to identify the determinants of FPI in Pakistan's agricultural sector.

A country's economic growth is also affected by the process of governmental selection, replacement and monitoring of the government; ability of government to devise and apply procedures and policies; people's respect and status of institutes responsible for administering economic and social relations. The governance systems have six indicators which are used in evaluating a country's governance level [10]. These factors include Voice and Accountability (VA); Political Stability and Absence of Violence / Terror (PV); Government Effectiveness (GE); Regulatory Quality (RQ); Rule of Law (RL) and Control of Corruption (CC). Because of FPI importance in boosting Pakistan's growth, this study aimed at examining the impact governance indicators on FPI during 2005-2017 through applying OLS model. This study is very important because before there are very few studies which have investigated the determinants of FPI in Pakistan.

The remaining study has been organized as follows: the literature review has been discussed in section two, the research methodology has been presented in section 3, the theoretical model has been presented in section 4, results have been presented in section 5 and conclusion has been discussed at the last section.

Literature review

Researchers have investigated varies determinants of foreign portfolio investment (FPI). According to [9], there had been dramatic increase in level of global foreign Portfolio investment (FPI) in the world. He argued that foreign portfolio investment (FPI) was considered a comparatively safe and efficient mean of moving capital to those countries where the demand of capital is greater, on the other hand this opinion was questioned by sequence of financial crises of Mexico in 1994 and the Southeast Asia in 1997 to 1998. Therefore, several economists debated that these crises were strange and reflect outstanding circumstances. However, a closer look depicts that the foreign portfolio investment (FPI) plays an important role in economic growth of a country.

[2] examined both Asian countries and firm-level authority and representation policies which effected investment distribution decisions. Based on the country-level survey, the authors argued that the U.S. investor invested more in open market which had stronger investor rights, better accounting standards and had improved legal structures. The U.S. funds were discovered to be invested more in companies which adopted policies which resulted in better development of economic growth. [12] found that FDI and FPI inflows had a positive effect on performance of developing economies as many of the developing countries have established financial markets with the help of FDI and FPI. The authors observed the influence of foreign capital inflows on growth of Indian markets and economy. The authors depicted that FDI has positive effect on growth of economy, whereas, the FPI has negative effect growth of economy.

[1] investigated the FPI determinants in Asian developing countries .The regression analysis identified that the real exchange rate, inflation rate, split of host capital market and indicators

of economic movement in the global stock market capitalization were statistically important determinants of foreign portfolio investment (FPI). The results showed that the variable of inflation rate had negative relationship, whereas the other three variables had positive relationship. The variable of foreign trade, foreign direct investment (FDI) and current account had statistically insignificant relationship. [14] observed the factors which affect Foreign Portfolio Investment (FPI) in India, which crossed approximately 12 billion US$ at the end of year 2002. These investment flows had significant influence on performance of the other household markets. The authors found that FPI inflows were influenced by the return of stock market, ex-ante risk and inflation rate (both foreign and domestic). The impact of the ex-ante risk and stock market returns had turned out to be most important factors of FPI inflows. The author suggested that the stock market's stability and reducing ex-ante risk will attract further Foreign Portfolio Investments (FPI) inflows which might have positive impact on the national economy.

[8] examined that comparatively low yield in developing countries together with higher economic growth rate and higher rate of return encourage foreign investors to shift their resources and funds in developing countries. The authors suggested that increase in foreign portfolio investment causes increase in trade development, international economic linkages and increase of production resources in host country. The authors found that improvement of home capital markets and reductions in capital flow restrictions attracted foreign investors to make foreign portfolio investment (FPI) in host countries which resulted in economics growth. The authors also evaluated the costs and benefits of foreign portfolio investment (FPI) for the recipient countries and presented the empirical evidence about association of market development with FPI, level of capital market and market volatility. [7] determined association of FPI and Malaysian economic growth during 1991 to 2006 and determined association of GDP with foreign portfolio investment. The authors suggested that foreign portfolio investment (FPI) positively influenced economic growth in host country.

[16] determined relationship of remittances with growth of Pakistan's economy through sector analysis by using the time series data through multiple regression analysis. The variables which were analyzed include GDP at current price, public investment (PG), inflation rate (INF), worker remittances (WR), private investment (PI), per capita income, squared per capita income and changes in terms of trade. They found that there was positive relationship among workers remittances and economic growth. [5] discovered the relationship of social and political factors and FDI for Pakistan during 1971 to 2005 through OLS model. The findings showed that the human capital had positive and significant relationship, whereas political instability had negative and insignificant relationship with FDI in Pakistan.

[11] empirically investigated the association of FDI with growth of Pakistan's economy for 1981-2008. The variable which were included in the model were foreign direct investment, economic growth, and residual time effect. They observed a longer run and direct association between these variables. The authors recommended that foreign direct investment is a primary factor for economic growth in developing country. [15] empirically investigated the influence of overseas capital inflows on growth of Pakistan's economy for the period of 1985 to 2010. The results explained that FPI, FDI and remittances positively and significantly affected economic growth, whereas, foreign support significantly but negatively correlated with economic growth. They further suggested that FPI, FDI and remittances had major influence on the economic growth. They also observed that Pakistan should improve the domestic resources to improve foreign aid.

[18] investigated the association of political instability, terrorism, electricity load-shedding, inflation, market size, trade-openness, incentives provided to investors and exchange rate stability with FDI in Pakistan during 1980 to 2010 by using ARMA

regression model. The results have shown that terrorism and political-instability had negative association while electricity load-shedding had positive impact on FDI. The results have also shown that exchange rate, market size, investors' incentives and trade openness positively affect FDI while the inflation rate had a negative association with FDI inflows. [4] analyzed determinants of FDI in Pakistan's agricultural sector for 2000-2010 by applying OLS model and reported that GDP and trade openness positively affect FDI, whereas, government debt negatively affect FDI flows in Pakistan.

[20] explored impact of governance indicators on FDI in Pakistan during 1996-2010 by utilizing OLS regression model. The results have depicted that political-stability, accountability, governmental effectiveness, absence of terror, control of corruption, regulatory quality and index of governance have positive effect on FDI.

[13] investigated the association of exchange rate and FPI in Nigeria during 2007 to 2016 and concluded that exchange rate significantly and positively affect FPI inflows in Nigeria. [3] examined determinants of FPI in Jordan during 2000-2016 and found that variables of inflation, economic activity, diversification of risk, governance and credit worthiness of a country have impact on FPI inflows for Jordan. [19] explored the relation of board governance with overseas institutional investors for tourism companies in Taiwan and demonstrated that foreign ownership is higher in case the companies have higher director's ownership and smaller boards.

It can be seen from the above mentioned literature review that there is no study which explored the impact of governance indicators on FPI in Pakistan's agricultural sector. Therefore, this study is intended to fill this research gap by identifying the association of governance indicators with FPI inflows in Pakistan's agricultural sector for the period of 2005-2017.

MATERIALS AND METHODS

In this study, time series secondary data has been uses for the period of year 2005-2017. The data for the dependent and independent variables have been gathered from Economic Surveys, SBP reports and World Bank Database. The Ordinary Least Squares (OLS) technique has been employed to determine the relationship of dependent variable i.e. foreign portfolio investment (FPI) in Pakistan's agricultural sector and independent variables i.e. governance index and control variables of inflation and GDP. The governance index has been formulated as follows:

Governance Index (GI) = f (VA, PV, GE, RQ, CC, RL)

First of all, the association of FPI with GI has be determined, then to check the robustness of regression results, the relation of FPI with individual governance indicators has been examined.

The following regression model has been used in this study:

$$LnFPI = \beta 0 + \beta 1\ GI + \beta 2\ INF + \beta 3\ RGDP + Ut$$

Where:

FPI = foreign portfolio investment
GI = Index of Governance Indicators
INF = Inflation rate
GDP = Real GDP growth rate
VA = Voice and Accountability
PV = Political Stability and Absence of Violence / Terror
GE = Government Effectiveness
RQ = Regulatory Quality
CC = Control of Corruption
RL = Rule of law

E-View 9.0 has been used to measure the relationship of variables.

The theoretical model of this study is shown in Fig.1.

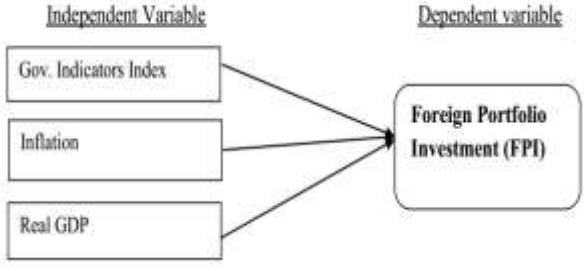

Fig.1. Possible Relationship of Governance Index and Foreign Portfolio Investment (FPI)
Source: Adapted from [6]

RESULTS AND DISCUSSIONS

Firstly, the ADF unit-root test has been employed in order to check stationarity of variables and results have been described in Table 2. The table 2 describes that all variables are stationary at level. So, based on results of Unit Root test, the suitable model is OLS which has been applied to estimate the relationship of governance factors with FPI in Pakistan's agricultural sector and the results have been described in Table 3 which depicts that value of Adjusted R-square is 0.68 which means that independent variables have explained around 68 percent of changes occurring in FPI for Pakistan's agricultural sector. The value of Durbin-Watson is 1.93 which means that there is no issue of autocorrelation among explanatory factors.

Table 2. ADF Stationarity Unit Root Test for Variables

Variables	T-ADF Statistics	Critical Values	Decision
LnFPI	-3.923915 (0.0011)	1% level = -3.356068 5% level = -2.595026 10% level = -2.233456	Stationary at level
VA	-4.306256 (0.0297)	1% level = -5.057910 5% level = -4.119910 10% level = -3.701103	Stationary at level
PV	-5.341167 (0.0133)	1% level = -1.057910 5% level = -2.119910 10% level = -4.701103	Stationary at level
GE	-2.678204 (0.0104)	1% level = -3.121990 5% level = -2.144920 10% level = -1.713751	Stationary at level
RQ	-4.750105 (0.0318)	1% level = -5.886426 5% level = -3.828975 10% level = -2.362984	Stationary at level
CC	-5.232348 (0.0615)	1% level = -2.057910 5% level = -1.119910 10% level = -1.701103	Stationary at Level
RL	-2.711510 (0.0246)	1% level = -5.057910 5% level = -4.119910 10% level = -1.701103	Stationary at level

Source: Own Calculation.

The panel I of table 3 indicates that the governance index has significant and positive impact on FPI in Pakistan's agricultural sector which means that if governance would increase by 1%, then FPI in agricultural sector will increase by 7.21%.

The variable of inflation is significantly and negatively affecting FPI which means that if inflation will be higher, then the FPI inflows will decrease in Pakistan's agricultural sector.

Moreover, the variable of GDP is significantly and positively influencing FPI which means that if GDP would be higher, then FPI inflows will increase in Pakistan's sector.

Table 3. OLS Regression Model

OLS Regression Model		
LNFPI	Coef.	Std. Err.
Panel I		
GI	7.213**	3.215
INF	-0.421**	0.130
RGDP	3.192***	2.356
C	3.718	2.627
Panel II		
VA	4.613*	2.412
PV	3.510*	1.519
GE	5.618***	2.164
RQ	0.136	2.155
CC	1.262***	1.187
RL	1.237***	2.233
INF	-1.304**	0.250
RGDP	2.355**	1.251
C	2.317	1.311

R-squared	0.741141	Mean dependent var	7.140533
Adjusted R-squared	0.681996	S.D. dependent var	0.982496
S.E. of regression	0.464986	Akaike info criterion	1.026809
Sum squared resid	1.065718	Durbin-Watson stat	1.93564
Log likelihood	-1.451067		
F-statistic	15.57444		
Prob(F-statistic)	0.000167		

***Significant at 1 Percent, ** Significant at 5 Percent, * Significant at 10 Percent.

Source: Own Calculation.

The robustness of regression results has been examined through association of individual governance variables with FPI inflows in agriculture and results have been reported in panel II of table which indicates that variable of voice and accountability (VA) significantly and positively affect FPI flows. It is estimated that if the voice and accountability improves by 1%, then FPI will increase by 4.61%. The results also describes that the variable of political stability (PV) significantly and positively influence FPI inflows. The estimated coefficient describes that if this variable is increased by 1%, then FPI will rise by 3.51%. The variable of government effectiveness (GE) also has significant and positive association with FPI flows that if there is 1% increase in GE there FPI will increase by 5.61% in Pakistan.

Furthermore, the variables of RL and CC also have positive and significant relation with FPI flows which that that there is increase of 1% in these variables, then FPI in agriculture will increase with 1.23% and 1.26 % respectively.

The variable of RQ has insignificant association with FPI in Pakistan's agriculture sector.

CONCLUSIONS

Foreign Portfolio Investment (FPI) performs a critical part in growth of developing economies and it also has a critical part in development of Pakistan's economy in general and agricultural sector in particular. A developing economy like Pakistan is extremely dependent on the foreign capital inflows as it has a critical role in growth of economy and agriculture. Thus, this research aimed at determining association of governance indicators with FPI flows in Pakistan's agricultural sector during 2005-2017. This research depicted that all the governance indicators excluding regulatory quality significantly and positively affect FPI flows in agriculture sector. The main contribution of this study is that it examined connection between governance variables and FPI in Pakistan's agricultural sector for first time. This study showed that governance variables have significant impact on FPI in agriculture. So, these variables need to be counted in formulating policies to attract higher FPI flows in agriculture sector.

It is being recommended that the controlling authorities should implement effectual processes for improving governance variables to reinforce trust of national and international investors and to enhance FPI flows in Pakistan's agricultural sector.

Following are the limitations of the study:

-Some other important variables can also be included in the model.

-The data for the extended time period can be included in the model.

-The burning issues of Pakistan like terrorism, political instability and energy crisis can also be included in the model.

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EFFECT OF WEEDING ON POPULATION OF FALL ARMYWORM (*SPODOPTERA FRUGIPERDA*) AND YIELD OF MAIZE (*ZEA MAYS* L.) IN UMUDIKE, ABIA STATE, NIGERIA

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Abstract

Field experiments were conducted in 2017 and 2018 second planting seasons, at the Research and Teaching Farm of the Faculty of Agriculture, Abia State University,Uturu Umuahia Campus to investigate the effect of weeding on the population of Spodoptera frugiperda and yield of maize. Two Maize varieties, OBA SUPER 2 (yellow seeded) and OBA SUPER 98 (white seeded) were planted as the main plot treatment while four weeding schedules (no weeding, 1, 2, or 3 weedings) were included as the sub-plot treatments. Seeds were sown on ridges 1.0 m apart and 50.0 cm between stands in 5.0 m^2 plots on 5th day of August each year. Data were collected on the number of larvae of fall Armyworm S. frugiperda larvae, damaged plants and grain yield of maize. All data were subjected to analysis of variance (ANOVA) and separation of means done using Least Significant Difference (LSD). During both years, it was found that the weeded plots had significantly ($P<0.05$) lower S. frugiperda population than the non-weeded plots. S.frugiperda population decreased significantly with increase in the number of times sub-plots were weeded. Thus, S.frugiperda population of 7.6 were recorded in the plots weeded thrice in 2017 and 8.3 in the year 2018; with twice weeding it was 10.3 and 10.5 in 2017 and 2018; and for once weeding it was 12.5 and 13.3 in the two years respectively. The non-weeded plot had 13.0 and 16.5 S. frugiperda in the two years respectively. The frequency of weeding was inversely correlated with S. frugiperda population. Grain yields were significantly higher when weeding was done three times compared with weeding twice, once and no weeding respectively. In the two years, the percentage leaf damaged were decreased as the number of weeding increased. There was no significant correlation between S. frugiperda and the grain yields in the two years suggesting that any of the weeding regimes, especially 2-weeding and 3-weeding can be adopted to reduce S.frugiperda infestation in maize with no significant effect on grain yield. In addition , any of the two varieties can be cultivated in the area to achieve good grain yield.

Key words**:** *weeding regimes, fall armyworm, maize yields, Nigeria*

INTRODUCTION

Weeds seriously limit maize production in Nigeria and elsewhere [3]. Weeds interfere with crops by competing for nutrients, water and light; they may also introduce allelochemicals into the habitat they share with crops [3]. The effects may be subtle at first (reduced plant vigour, delayed development or suppression of specific characters) but the ultimate effect is reduction of crop yields [5, 3]. According to [14], the presence of weeds in maize fields reduced crop yields by 40 to 60% depending on the intensity of weed infestation. According to [3] weeds may habour insects and pathogenic organisms harmful to crop plants. The insects at some stage of their life feed on plant root, Stem, leaves and flowers and reduce their vigour or kill them. Weeds can also act as alternate and alternative host plants for disease pathogens and other pests thus making the control of such diseases and pests more difficult [8, 3].However, there is little or no information on the effects of weeding on the population of *S. frugiperda* associated with maize crop in Umudike, a rain forest tropical environment, hence this study was undertaken.

Objectives of the Study

It was the objectives of this study to: (i) determine the population of *S. frugiperda* on maize crops in Umudike; (ii)determine the proportion of damage done by *S. frugiperda*

on maize crops in the area; (iii) determine the effect of weeding regimes on population of *S. frugiperda*; (iv) relate the larvae population of *S. frugiperda*, grain yields and leaf damaged.

MATERIALS AND METHODS

Field experiments were conducted in 2017 and 2018 during the second planting season at the Research and Teaching Farm of the Faculty of Agriculture, Abia State University, Uturu, Umudike Campus to investigate the effect of weeds on fall armyworm *Spodotera frugiperda* of maize. Umudike is located at (Latitude 05^0 $29^{'}$N; longitude 07^0 $33^{'}$E and Altitude of 122m above sea level) in the rain forest belt of Nigeria.

A land area of 320m was ploughed and harrowed. Two varieties of maize OBA SUPER 98 (white seeded) and OBA SUPER 2 (yellow seeded) obtained from Agro input unit of Abia State Ministry of Agriculture, Umuahia were planted. The maize varieties occupied the main plots. Four hoe-weeding regimes (no weeding, 1, 2, and 3 weedings) were used as the sub plot treatments. The first weeding commenced 3- Weeks After Planting (3-WAP) and continued at three weekly intervals according to the number of weedings. Thus, first weeding was carried out at 3 WAP, second at 6-WAP and third at 9-WAP. Each sub plot measured 5m x 5m and was separated by 1.5m paths. The treatments were replicated four times and arranged in a split plot design. Maize was planted in rows on plots spaced 1.0 m between rows and 50.0 cm within rows at two seeds per stand and 3.0 cm deep. The seedlings were thinned to 1per stand at twenty days after seedling emergence. On the same day, a compound fertilizer, N. P.K 15: 15:15 was applied by band at the rate of 75 kg/ha. Ten plants were randomly selected per plot and sampled at each sampling date by direct visual counting using the Tally Counter (A quick counting device). Sampling was done in the morning between 6.30 and 8.30am on each sampling date. Sampling involving counting all the larvae present in each chosen plant. Sampling for larvae started when the crops were 3weeks old after the first weeding.

An area 2x2 ($4m^2$) in the centre of each plot was marked out for determining yield. Plants in the four middle rows were used. Maize cobs were harvested 90 Days After Planting (DAP) and the weight of cobs per plot was determined by harvesting all the plants in each plot and weighing them fresh in kg using an electronic balance. The cobs were later sundried by spreading them out in benches in screen-house for 2-3 weeks. Maize grains were weighed after extraction from the cobs in kilograms and recorded at about 14.0% moisture content. The moisture content was determined by using a moisture meter. The yields were expressed in Kg/ha. Damaged and undamaged leaves in each plot were usually counted. A plant with 25.0% and more of it leaves damaged was considered a damaged plant otherwise it was undamaged [11]. The percentage (%) leaf damaged was calculated and recorded as follows:

$$\% \text{ leaf damaged} = \frac{\text{total number of leaves damaged}}{\text{total number of leaves in sample}} \times 100$$

Data collected were analysed using the analysis of variance (ANOVA), while the Least Significant Difference (LSD) was used to separate the means. Simple regression and correlation analysis was performed to show the relationship between the larvae population, grain yields and leaf damaged.

RESULTS AND DISCUSSIONS

The results on the effect of weeding on the population of *S.frugiperda* larvae and leaves damaged in maize in 2017 and 2018 are presented in Tables 1 and 2.

S. Frugiperda population density on OBA SUPER 98 and OBA SUPER 2 in 2017, was 8.01 and 8.55, while in 2018, it was 10.45 and 10.13, respectively. The weeded plots resulted in significantly ($P<0.05$) lower *S. frugiperda* population than the non-weeded (control) plots. The number of weeding resulted in significant ($p<0.05$) effects on *S. frugiperda* population. Thus, three weeding resulted in significantly lower larvae population of 3.23/ plants in 2017 and 6.35/ plants in the year 2018 compared to 2-and 1-

weeding that had 5.03 and 8.30/plant respectively in 2017 and 8.32 and 10.45/plant respectively in 2018.

Table 1. Effect of weeding on the population of *S.frugiperda* larvae and leaves damaged in maize in 2017

Treatments			
Varieties	larvae/ plant	Grain yield (Kg/ha)	% leaf Damaged
OBA SUPER 98	8.01	1,600.43	25.15
OBA SUPER	8.55	1,800.02	22.16
SE±	0.07	3.65	0.27
LSD (5%)	0.25	10.45	0.73
Weeding			
Control	12.01	510.20	39.05
1-weeding	8.32	954.15	35.18
2-weeding	5.03	2,105.43	36.80
3-weeding	3.23	2,200.12	30.15
SE±	0.28	4.28	1.40
LSD (5%)	0.52	9.58	0.98

Source: Field Experiment, 2017.

The control plants recorded the highest number of *S. frugiperda* per plant 12.01 and 15.60, respectively in 2017 and 2018. The higher *S. Frugiperda* larvae population that was observed in the non-weeded maize plots confirmed report by [1, 12, 13] that weeds acted as reservoir for some insect pest that subsequently infest crop plants.

Table 2. Effect of weeding on the population of *S.frugiperda* larvae and leaves damaged in maize in 2018

Treatments			
Varieties	larvae/ plant	Grain yield (Kg/ha)	% leaf damaged
OBA SUPER 98	10.45	475.15	23.43
OBA SUPER	10.13	590.50	21.75
SE±	0.15	1.62	0.17
LSD (5%)	0.38	4.98	0.63
Weeding			
Control	15.60	4,950.17	38.81
1-weeding	10.45	905.14	20.25
2-weeding	8.30	1,545.13	24.13
3-weeding	6.35	1,834.75	15.43
SE±	0.23	4.25	0.24
LSD (5%)	0.59	9.74	0.57

Source: Field Experiment, 2018,

Grain yields of maize (Table 2) were significantly ($P<0.05$) higher in the weeded than the non-weeded plots. Significant differences were also obtained among the weeded plots. The highest grain yields were obtained from the 3-weeding plots, which gave 2,200.12 kg/ha in 2017 and 1,834.75 kg/ha in 2018, while 2-weedings gave 2,105.43 kg/ha and 1,545.13 kg/ha in 2017 and 2018, respectively. The 1-weeding plot gave 954.15 and 905.14 kg/ha in the corresponding years. The lower grain yield observed on these plots confirms report by [5, 15, 9] that the ultimate effect of weed interference on crop plant is reduction of crop yield.

Similarly, [14] reported that uncontrolled weed growth during period of 10 and 30 days after crop emergence reduced maize yield by 40 to 60% [7] reported that caterpillar of *S.frugiperda* appear to be much more damaging to maize in the west and central Africa than most other *Spodoptera* species. Infestations during the mid-to late-whorl stage of maize development caused yield losses of 15-73% when 55-100% of the plants were infested with *S.frugiperda* [6, 7].

The percentage leaf damaged was significantly ($P<0.05$) lower on OBA SUPER2 than in OBA SUPER 98. The weeded plots resulted in significantly lower percentage damaged leaves than non-weeded plots. The relationship between *S.frugiperda* population, grain yields and damaged leaves is presented in Table 3.

There was an indication of high correlation (Table 3) between *S.frugiperda* and grain yield ($r=-0.931$ and -0.935) in 2017 and 2018, respectively. The leaves damaged decreased as the number of weeding increased. Thus, 30.15 and 15.43% damaged leaves was obtained in the 3-weeding; 35.18 and 24.13% in the 2- weeding plots while 36.8% and 26.25% were obtained in the 1- weeding plots in 2017 and 2018, respectively.

The highest percentage leaf damaged was obtained in the control plot 39.05 and 38.81 in 2017 and 2018, respectively.

Table 3. Regression and Correlation analysis showing the relationship between the *S.frugiperda* population, grain yields and damaged leaves

Variables	Regression equation	R^2	r
2017			
S.frugiperda population and grain yield	Y=4.176-0.00405X	0.903	-0.931
S.frugiperda and damaged leaves	Y=-14.936+1.026X	0.951	0.968
2018			
S.frugiperda population and grain yield	Y=8.117-0.000871X	0.850	-0.954
S.frugiperda and damaged leaves	Y=-3.0612+6.693X	0.842	0.925

Source: Field Experimets 2017 & 2018.

The percentage leaf damaged which was observed to decrease as the *S.frugiperda* population decreases in weeding plots further explained the activities of some insect pests; for example, *S.frugiperda* larvae [7] in causing damage to the leaves and resulting in the yield losses: the larvae then migrate to adjacent area in true armyworm fashion. These results are similar to those of [4], that reducing the weeding interval which directly increase the number of weedings, enhanced grain yields while [2] reported that the two weedings at three and six weeks after planting are necessary for most legumes.

The higher *S. Frugiperda* larvae population that was observed in the non-weeded maize plots confirmed report by [1, 12, 13]; that weeds acted as reservoir for some insect pest that subsequently infest crop plant. The lower grain yield observed on these plots confirm report by [5, 15, 9] that the ultimate effect of weed interference on crop plant is reduction of crop yield.

Similarly, [14] reported that uncontrolled weed growth during period of 10 and 30 days after crop emergence reduced maize yield by 40 to 60%. [7] reported that caterpillar of *S.frugiperda* appear to be much more damaging to maize in the west and central Africa than most other *Spodoptera* species. Infestations during the mid-to late-whorl stage of maize development caused yield losses of 15-73% when 55-100% of the plants were infested with *S.frugiperda* [6, 7].

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CONCLUSIONS

There was no difference between the two varieties in the terms of their response to the damage caused by the larvae. The three weeding regimes, 1-weeding, 2-weeding, and three-weeding were effective against the larvae of *S.frugiperda.* Therefore, any of the weeding regimes especially 2-weeding and 3-weeding can be adopted to reduce *S. frugiperda* infestation in maize depending on their cost- benefit analysis. Similarly, any of the two varieties of maize can be cultivated in the area for a good grain yield.

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THE EFFECT OF SWEET POTATO (*IPOMOEA BATATAS* L.) TUBER AND LEAVES *BRANGKASAN* SUBSTITUTION IN THE GROWTH PHASE LANDRACE BALI PIG (3-6 MONTHS AGE) RATION

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Abstract

The high price of feed/ration is the biggest problem for farmers, so it requires a way to find quality but cheap feed ingredients, for example using brangkasan/*stucker, which are sweet potato leaves and twigs and tubers as feed ingredients substitution for pigs, the protein and energy content is still quite high, but the economic value has not been realized by the farmers. This study aims to determine the effect of some percentage tubers and sweet potato* brangkasan/*stucker to substitute the concentrate, on the performance of landrace Bali pigs. The study used a Completely Randomized Design method (CRD) with 4 treatments consisting of : T-1 30% concentrate + 60% pollard + 10% sweet potato* brangkasan/*stucker as control, T-2: 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% sweet potato leaves* brangkasan/*stucker, T-3:10% concentrate + 50% pollard + 30% sweet potato tuber + 10% sweet potato leaves* brangkasan/*stucker and T-4:10% concentrate + 40% pollard + 40% tuber +10% sweet potato leaves* brangkasan/*stucker, which are repeated 5 times. Based on the results of the study, T-2 (giving 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% sweet potato leaves* brangkasan/*stucker) causing an increase in body weight gain, final body weight and feed consumption, but decrease the feed conversion. Thus, it can be concluded that the substitution of sweet potato tubers and leaves* brangkasan/*stucker can be used as feed for growth phase landrace Bali pig.*

Key words**:** *landrace Bali pig, sweet potato tuber and leaves* brangkasan/*stucker*

INTRODUCTION

In line with the increasing population and public awareness of the nutritional benefits of growth, the need for meat is also increase to fulfil community nutrition. This can be seen from the amount of meat consumption which has increased to 10.06 Kg per capita per year, and the production of livestock meat other than beef/buffalo, including pork in 2017 was 2,770,890 tons, decreased 0.92% compared to 2016, although in the last five years it increased by 4.50% [1]. To meet the needs of the community for animal protein from meat, it is necessary to increase meat production, to meet the needs of animal protein is to intensify pigs farming. Estimation output of Bali landrace pig, are between 45.5-70.49% [9].

Indonesia has a number of native pigs breed, such as the Bali, Nias, Papua and the Sumba pigs, which are kept by farmers in their original place. The government shows its concern to develop this original pigs research to find out the characteristics of native pigs and their possible contribution to produce with simple maintenance system [7].

Indonesia is the country that has the largest pig germplasm in the world, which is five out of eight species, but the native population is decreasing [8]. The meat colour and cooking loss of landrace Bali pig as variables, more better than the landrace Bali pig crossing [10]. Pigs, especially landrace Bali pigs, are very suitable to be developed in Bali because almost every family, especially in rural areas, raising pigs is only a side business, whose function is to use food scraps while providing

additional income for the family. Pig raising in Bali, especially in rural areas, has an important role to increase family income, and plays an important role in traditional and religious ceremonies [5]. Natural increase landrace Bali pig more better than Bali pig crossing [9].

Brangkasan/stucker, are leaves, stems and tubers of sweet potatoes, which are used as feed for pigs, because the protein and energy content is still quite high but the economic value has not been realized by farmers.

Sweet potato (*Ipomoea batatas* L.) have an important role as human food [6]. Sweet potato (*Ipomoea batatas* L.) have main nutritional material in tuber are carbohydrates (starches), proteins, fats and vitamins that are soluble in fat [4]. Sweet potato (*Ipomoea batatas* L.) are important carbohydrate-producing plants and also can be used as feed ingredients for livestock. The protein content of leaves is much higher than in the tuber, thus sweet potatoes leaves are very good as animal feed, and are one of the forages that can be given to pigs. This is because the crude fibre content in sweet potato leaves is relatively low at 17.3% [2]. The sweet potato tuber are rich in protein, also which cultivated in Poland [3]. It has a high nutritional values, about 50% higher than the potato. Furthermore, it is said that the protein content of the fresh matter tuber, is 1.35g $100g^{-1}$.

Tubers are main usable part of the sweet potato, although leaves can also be used. The leaves is 20.2% protein with a digestibility of 80.2%. Sweet potato are a good and inexpensive energy source because they contain high carbohydrates around 25-35 grams. Therefore, the use of non-economical tubers as pig feed can be used as feed ingredients, because energy is the main requirement for livestock to grow and develop. The biggest component of a ration is energy and for pigs by 70%. The ration in pigs is expected to have 16% protein content, and 12% fibre content with daily consumption of ration 0.9 to 2.0 Kg. Along with the increasingly concentrate as high quality of feed, it is endeavoured to find other foods that are easily obtained at lower prices. Sweet potato (*Ipomoea batatas* L.) are important carbohydrate-producing plants and can be used as feed ingredients for livestock. Therefore, this study was conducted to examine the effect of sweet potatoes *brangkasan*/stucker tubers and leaves substitute in the rations on final body weight of growth stage landrace pigs with ages between 3-6 months.

MATERIALS AND METHODS

Materials

This research used 12 female 3-month-old landrace Bali pigs with body weight range between 11.5 Kg - 13.5 Kg, purchased from farmers in the village of Tejakula-Buleleng. The cage used was 4 (four) pieces sized 3x2 x1 meter, and each cage consists of 3 bulkheads and each bulkhead is filled with one pig. The study lasted for 3 months, and feed was given morning and evening.

Methods

This research use a Completely Randomized Design (CRD) with four treatments and five replications, consisting of:

a. T-1: 30% concentrate + 60% pollard + 10% sweet potato *brangkasan/*stucker as control

b. T-2: 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/stucker,

c. T-3: 10% concentrate + 50% pollard + 30% sweet potato tuber + 10% leaves *brangkasan*/stucker,

d. T-4: 10% concentrate + 40% pollard + 40% sweet potato tuber + 10% leaves *brangkasan*/stucker.

The research variables studied initial body weight, weight gain, final body weight, feed consumption, and feed conversion.

The research was carried out at Central Laboratory, Department of Animal Sciences, Faculty of Agriculture, Universitas Warmadewa.

Statistical Analysis

The study was carried out experimentally, used a Completely Randomized Design (CRD) of unidirectional patterns, with four treatments and five replications, consisting of:

a. T-1: 30% concentrate + 60% pollard + 10% sweet potato *brangkasan/*stucker as control

b. T-2: 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/stucker,
c. T-3: 10% concentrate + 50% pollard + 30% sweet potato tuber + 10% leaves *brangkasan*/stucker,
d. T-4: 10% concentrate + 40% pollard + 40% sweet potato tuber + 10% leaves *brangkasan*/stucker.

The data obtained were then analyzed by variance, and if there were significant differences (P<0.05) between treatments, followed by the Least Significant Difference (LSD) (SPSS-21 software package) is carried out.

RESULTS AND DISCUSSIONS

Initial body weight, weight gain, final body weight

Based on the results of the study, obtained from initial body weight, weight gain, final body weight, as listed in Table 1.

Table 1. The Effect of giving *brangkasan*/stucker sweet potato tuber and leaves on Initial Body Weight, Weight Gain, and Final Body Weight

Variables	Treatments (Kg/head)				
	T-1	T-2	T-3	T-4	SEM[2]
Initial Body Weight	12.67[a]	12.67[a]	12.67[a]	12.67[a]	4.98
Body Weight Gain	43.93[a]	45.16[b]	35.83[c]	25.16[d]	8.89
Final Body Weight	56.60[a]	57.83[a]	48.50[b]	37.83[c]	4.98

Source: Own results in the laboratory.
Notes: 1. SEM: Standard Error of the treatment means
2. Values with the same letters on the same line show no significant difference (P> 0.05)
3. Different letters on the same line show significant differences (P <0.01)

Table 1 shows that the use of 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/stucker (T-2) on body weight gain was higher than T-1 (control), significantly different (P<0.01), because feed with the content of complex food substances will produce faster growth compared to ration which is reduced by one of its important substances. This is in accordance with the statement of Anggorodi (1979) which states that the growth of livestock by the amount of food eaten, where the more the amount of food consumed, the higher the growth of livestock produced. Then T-3 and T-4 was lower than T-1 and T-2, very significantly different (P<0.01). This was due to the treatment that the sample was fed with lots of brangkasan*/stucker* sweet potato, consumed more crude fibre. An increase in the crude fibre content in the ration can reduce the metabolic energy (ME). High levels of crude fibre can cause disruption of other substances digestion. In Figure 1 which shows the effect of giving tubers and leaves *brangkasan* sweet potatoes (*Ipomoea batatas* L) to the body weight gain of landrace Bali pig.

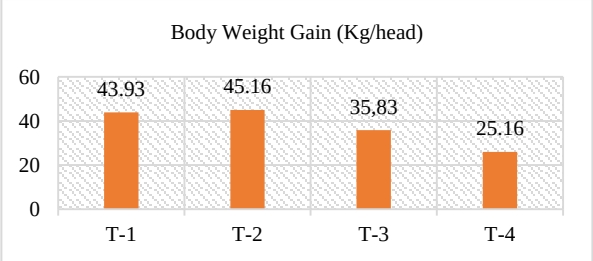

Fig. 1. The landrace Bali pig weight gain in several treatments.
Source: Own results in the laboratory.

The final body weight of the T-1 treatment was lower when compared to the T-2 but was not significantly different (P> 0.05); because T-2 had a low metabolic energy content, unless the material has a good energy source such as starch or carbohydrates. While T-3 and T-4 was lower than T-2, which was significantly different (P<0.01); because it has the same amount of energy and protein content but different coarse fibres will affect the amount of rations consumed. The low final body weight in T-3 and T-4, because the crude fibre content in the ration is too high which causes the chance of absorption of food substances decreases. Increased crude fibre in the ration, the consumption of feed increases, which will cause energy production to decrease.

Figure 2 shows the effect of giving sweet potato (*Ipomoea batatas* L) tuber and leaves *brangkasan* /stucker towards final weight of landrace Bali pigs.

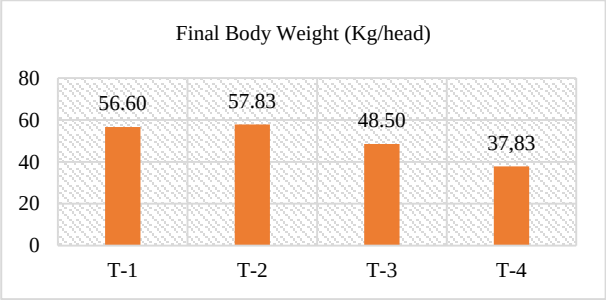

Fig.2. The effect of giving tuber and sweet potato *brangkasan*/stucker (*Ipomoea batatas* L) towards final weight of landrace Bali pigs.
Source: Own results in the laboratory.

From Figure 2, T-2 has higher final body weight, compared to other treatment, because T-2 has low metabolic energy content.

Feed Consumption and Feed Conversion

In Table 2, one may see the results for Feed Consumption and Feed Conversion

Table 2. The Averages data of Feed Consumption and Feed Conversion

Variables	Treatments				
	T-1	T-2	T-3	T-4	SEM
Feed Consumption (Kg/head)	122.50[a]	120.42[a]	111.00[b]	102.08[c]	4.40
Feed Conversion Ratio (FCR)	2.81[a]	2.68[a]	3.14[a]	3.95[a]	1.85

Source: Own results in the laboratory.
Notes:
1. SEM: Standard Error of The Treatment Means
2.Values with the same letters on the same line show no significant difference (P>0.05)
3.Different letters on the same line show significant differences (P<0.01)

Table 2 shows that the ration consumption in treatment T-1 is higher than treatment T-2 but statistically is not significant different (P> 0.05). This is because in treatment T-2 gets rations with higher energy and protein content (low crude fibre) so will growth faster, and the ration consumption lesser if rations are consumed with good metabolize energy. Energy and protein consumed are related to the tissue formed. Whereas in treatment T-3 and T-4 lower than T-2, was statistically very significantly different (P<0.01); because the food consumed has the same energy and protein content, but it has different feed crude fibre content, so it is clear that the consumption of rations in T-2 treatment is higher than the treatment of T-3 and T-4 treatments, because the increase in crude fibre content in T-3 and T-4 treatments, can reduce digestibility. In addition, the increase in crude fibre content in the ration can lead more efficient use of metabolic energy caused by transferring the portion of the net fraction of muscle energy needed to push the remaining food along the digestive tract.

Figure 3 shows the effect of giving tubers and leaves *brangkasan*/stucker propagate to feed consumption in landrace Bali pigs.

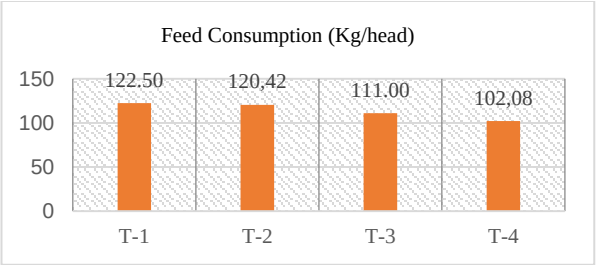

Fig. 3. Feed Consumption of landrace Bali pig in various treatments
Source: Own results in the laboratory.

T-2, T-3 and T-4 were lesser consumed by the pig, compared to T-1. Even the consumption were less but the growth of the pig was not significant different with T-1.

Feed conversion

Feed conversion is one indicator that can provide an illustration of the level of efficiency of ration used, the lower the ration conversion value, the better the efficiency of the ration used. T-2 (10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/stucker) gave the best feed conversion.

Although the FCR produced was not significantly different (P> 0.05), there was a tendency for pigs that received T-2 treatment, which had the ability to more efficiently convert food ingredients into meat or in other words the amount the food needed to increase one-unit weight is smaller than that of pigs giving the treatment T-1.

In the treatment of T-3 and T-4 the ration conversion was low so that body weight gain was also low as a result of the pigs being inefficient in utilizing rations which caused low ration conversion. An increase in crude fibre content in the ration causes the

opportunity to absorb food substances for growth to decline.

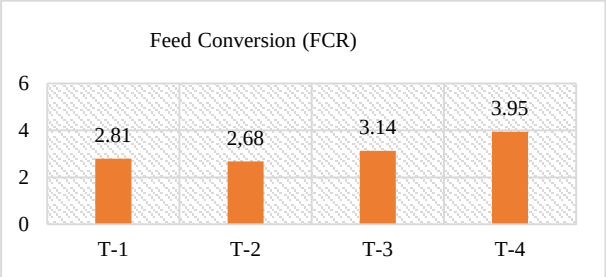

Fig. 4. Feed Conversion on landrace Bali pig for each treatment
Source: Own results in the laboratory.

Then it is presented in Figure 4 about the effect of giving tuber and leaves sweet potato *brangkasan*/stucker to the conversion of landrace Bali pig rations. The T-2 gave the best feed conversion for growth phase landrace Bali pig, that giving tuber and leaves sweet potato *brangkasan*/stucker.

CONCLUSIONS

From the results of the study, it can be concluded that giving 10% concentrate + 60% pollard + 20% sweet potato tuber + 10% leaves *brangkasan*/ stucker, can increase weight gain, final body weight, and ration conversion but decrease the ration consumption compared to the control ration. It means that giving *brangkasan*/stucker tuber and leaves sweet potatoes (*Ipomoea batatas* L) as the concentrate substitution, can be used to growth phase landrace Bali pig ration.

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ANALYSIS OF DOMESTIC PRODUCTION IN RELATION TO THE DEMAND AND SUPPLY OF GRAPES IN ROMANIA

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Abstract

The vine sector represents an important branch of agriculture in Romania, thus it is considered necessary a detailed analysis of it, for the passing 12 years, taking into account the characteristic technical-economic elements, as well as the components of demand and supply and foreign trade. The paper aims to determine both the trade deficit, by analyzing the trade balance, as well as by calculating the share held by the domestic production of grapes in the supply and demand on the internal market. Thus, will be determinate the degree to which the demand is covered by the domestic production,, but also the weight held by the domestic production offered.

Key words**:** *consumption, demand, indicators, supply, trade balance*

INTRODUCTION

Among the most developed sectors of the Romanian agriculture it is the vine and wine sector, which has benefited from a great financial support with the accession of Romania to the European Union. Both the PNDR program 2007-2013 and the PNDR 2014-2020 reported a majority absorption of the funds destined to the viticulture, the main investments being made in the new plantations and purchase of technologies and machines.

The Romanian vine and wine sector represents an important weight in the Romanian agriculture, the geographical location of the country and its relief ensuring all favourable conditions for this culture. [2] According to the law no. 244/2002 of the vine and the wine, the vineyards plantations are grouped territorially in wine regions, wine areas, wine centres, vineyards and vineyards.[5]

In Romania are 8 wine regions: Hills of Moldova, Hills of Muntenia, Hills of Oltenia, Hills of Banat, Hills of Crișana and Maramureș, Plateau of Transylvania, Terraces of Dobrogea.[6][8]

Regarding the areas occupied by the vineyards, Romania occupies the 11th and 5th place in the world in the EU, the industry developed in this sector having a significant contribution to the national GDP. [1]

The main raw materials resulting from these plantations are table grapes and wine grapes. According to the specialized studies the wine grapes represent a share of approximately 95% of the total grape production, the resulting product being analyzed both quantitatively and qualitatively to be within the European norms.

In the paper “Potential and risk in Romanian wine industry", by Bărbulescu O. (2017), are presented some historical, geographical and institutional landmarks of the national wine sector, highlighting that promoting this sector on foreign markets is essential, as well as the use of native varieties of vines. In order to capitalize on the tourism potential of the wine sector, Romania has a series of wine cellars that attract tourists during the harvest of grapes, as they are great lovers of tasting various assortments of wine, according to National Tourism Development Master Plan 2007-2026. Lădaru et al. (2014) [4] sustained a series of hypotheses regarding the competitiveness of the wine sector aimed at increasing the attractiveness of Romanian grape varieties and wines on the domestic and foreign market, thus stimulating consumption.

MATERIALS AND METHODS

The statistical data taken in the analysis in the paper were provided by INSSE (National Institute of Statistics), Trade Map and MADR, but also information obtained from the specialized documents and reports.
With the help of research methods and the specialized literature, the commercial deficit and the importance of ensuring the necessary consumption will be highlighted.
The data taken in the study it is over a period of 12 years, presents a retrospective of the vine and wine sector, being necessary an analysis of the surfaces, the total and average productions per hectare, thus processing the series of chronological data with the help of different statistical indicators such as arithmetic mean, standard deviation, coefficient of variation and annual rate, these being determined using the following formulas:

-*arithmetic mean:* $\bar{X} = \frac{\sum_{i=1}^{n} x_i}{n}$, where x_i- observed values; n- number of observed values;

-*standard deviation*: $S = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{N-1}}$, where x_i- observed values; N- number of observed values, $\bar{x}$– the average of the observed values;

-*average annual rate*:
R= [radical by order n-1from (x_n / x_0)] - 1 * 100, where x_n,x_0 – current year value - previous year. [3],[8]

RESULTS AND DISCUSSIONS

According to international statistical data, Europe has the largest area of vines, about 3.6 million hectares, followed by Asia with 1.9 million hectares and America with 975 thousand hectares. [7]
Romania has an average area of 179.53 thousand hectares of vineyards, the majority of which is held by the wine grape areas with 95.5% (171.63 thousand hectares), the areas with table grapes being only 4.5% (8.28 thousand hectares).
About 60% of the country's wine-growing area is owned by three regions: Moldova, Muntenia and Dobrogea, in these areas where favorable conditions for the development of viticulture are found [9].

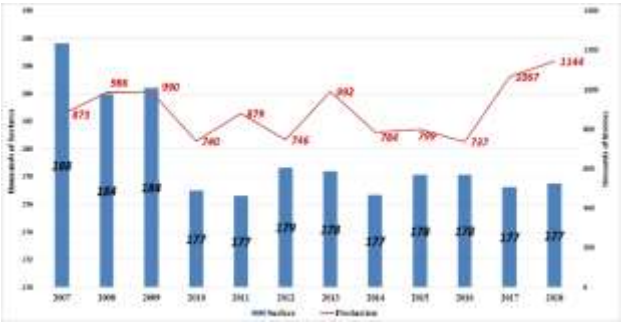

Fig. 1. The evolution of vine areas and grape production in Romania
Source: own processing based on INSSE

During the period 2007-2018, the area with vines registered a negative annual rate of -0.5%, with a decrease of 5.4% in total, from 188,629 hectares in 2007 to 177,497 hectares in 2018.
The surface of the vineyards on the fruit recorded, during the analyzed period, a deviation, compared to the average, of 3.66 thousand hectares, which resulted in a coefficient of variation of 2%. This coefficient being reduced, considering that vineyards are perennial.

Table 1. Statistical indicators on the evolution of areas (hectares)

Specification	Average	Minimum	Maximum	Annual rhythm	Standard deviation	Coef.. Variation
Total- vines	179,531.2	176,616	187,629	-0.50	3,665.59	2%
Table grapes	8,281.8	6,335	11,202	-5.05	1,520.01	18%
Grapes of wine	171,463.2	167,420	176,427	-0.27	3,002.01	1.7%

Source: data processed from the INSSE.

During the study period, it can be noted that the introduction of a restructuring / conversion measure of the vineyards (according to MADR) had a positive impact on the wine sector so that, with the introduction of this measure in 2010, about 5 were subjected to conversion, 1 thousand hectares, in 2013 about 7.4 thousand hectares, and in 2015 only 2,900 hectares. By accessing this measure, the Romanian producers have succeeded in reviving this sector. This could be possible by restructuring and modernizing important areas of vines that correspond to the current market requirements.

Analyzing the total production of grapes in the period 2007-2018, it is noted that at country level it fluctuated, registering a coefficient of variation of 15.51% per year, with an annual growth rate of 2.48%, this due to - it mainly produces wine grapes. The average grape production for the analyzed period is 894.8 thousand tons, registering a minimum production of 736.8 thousand tons in 2010 and a maximum one of 1.14 million tons in 2018.

Table 2. Statistical indicators on production evolution (tonnes)

Specification	Average	Minimum	Maximum	Annual rhythm	Standard deviation	Coef.. Variation
Total- vines	894,822	736,892	1,144,305	2.48	138,795.6	15.51%
Table grapes	56,880.17	35,959	81,789	-1.17	16,208.4	28.50%
Grapes of wine	839,216.6	690,462	1,072,900	2.79	131,030.6	15.61%

Source: data processed from the INSSE.

The average production per hectare of grapes followed an oscillating trend, registering values between 4,163 kg/ha and 6,447 kg/ha. All these fluctuations are due to both the restructuring of the surfaces, the climatic influence and the biological conditions (varieties, rootstocks), the technology adapted to each variety and plantation.

According to the data in Fig. 2, it can be observed that the average grape production has recorded inversely proportional values of the areas recorded, indicating that although the areas of grapevine have decreased, the average yields have remained or increased, this being due vine varieties with high yields. If in 2007, the average production was 4,654 kg/ha, in 2018, it increased by up to 27%. (6,447 kg / ha).

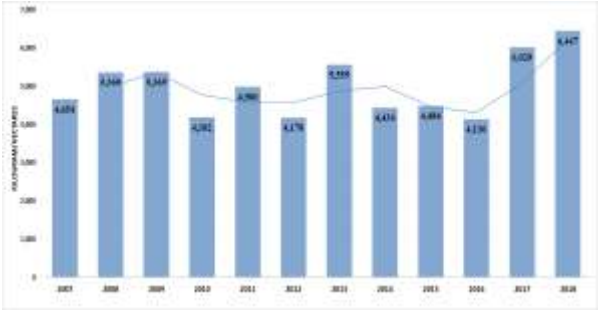

Fig. 2. Evolution of average grape production per hectare

Source: data processed from the INSSE.

The imports of grapes from the quantitative point of view, shown in Fig. 3, show a growth trend starting with 2011 in which 17.82 thousand tons were imported, reaching 44.99 thousand tons in 2018, the quantity of grapes imported being 2 times larger.

Among the top countries from which Romania imports grapes in 2018 are Moldova (12,045 tons), Spain (7,871 tons) and Italy (4,476 tons), compared to 2016, the imports is growing in 2017.

During the analyzed period it can be observed that the quantity exported of grapes is reduced. The smallest quantitative value registering in 2018, of only 0.43 tons, and the highest in 2012 with a volume of 1,822 tons.

However, as can be seen in the figure below, even though Romania exported the most in 2012, the trade balance is not the most favourable in that year, with a deficit of 27.8 tones, thus, the level trade balance is dictated by the volume of imports.

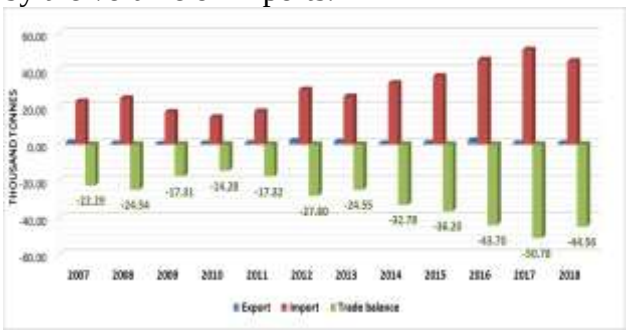

Fig.3. Quantitative commercial balance of grapes (tones)

Source: own processing based on trademap.org

From a value point of view, the imports of grapes show an upward trend, so that if in 2010 the value of the imports was of 11.13 million USD, in 2018, this value being 5 times higher (55.31 million USD).,

Fig.4. Value trade balance of grape (tones)

Source: own processing based on trademap.org

In Fig. 4 we can see the evolution of the commercial balance of grapes. It shows a tendency to increase the deficit, this situation can be generated by the high quantity of imported grapes and the low price that is practiced abroad. In 2018, the deficit value it is reached at 54.78 $ million.

In order to determine the average purchase and sale price of grapes from Romania, we analysed the volume and value of imports and exports, so over the 12 years there is recorded an average export price in the amount of 1.3 $ per kilogram, registering a decreasing trend. The average import price for the analyzed period is lower than the export price, being worth 0.92 $ per kilogram, but with an increasing trend.

Table 3. Demand and supply of grapes from Romania

Specification	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Domestic grapes production (table grapes, thousands tones)	81.3	81.8	73.5	49.7	56.0	49.0	55.4	36.0	42.1	38.8	47.7	71.4
Import (thousands tones)	23.2	24.9	17.5	14.6	17.8	29.6	25.9	33.1	36.9	45.9	51.3	45.0
Export (thousands tones)	0.9	0.3	0.2	0.3	0.5	1.8	1.3	0.3	0.7	2.2	0.5	0.4
Supply of grapes (thousands tones)	103.6	106.3	90.8	63.9	73.3	76.8	79.9	68.7	78.3	82.5	98.5	116.0
Grape consumption kg/inhabitant/year	5.5	7.6	7.3	5.4	6.6	6.3	6.7	6.2	6.9	6.9	7.9	7.19
Share of internal grape production from supply %	78%	77%	81%	78%	76%	64%	69%	52%	54%	47%	48%	62%
Demand (thousands tons)	116.2	156.8	149.2	109.6	133.3	126.6	134.1	123.7	137.1	136.3	155.2	140.5
Share of internal grape production from demand %	70%	52%	49%	45%	42%	39%	41%	29%	31%	28%	31%	51%

Source: own processing based on www.insse.ro data, demap.org, MADR.

Factors that could influence the demand for grapes can be: standard of living, lifestyle, purchasing power and consumer preferences. The supply of grapes can be determined by technical indicators such as: cultivated areas, total and average yields, technologies used, climatic factors.

The supply of grapes is determined in a significant proportion by the internal production of grapes, to which the volume of imports is added and the volume of exports is decreased. In conjunction, an average growth rate of supply of 1.02 % is recorded. Thus, it can be appreciated that the volume of imports is the one necessary to ensure the stability of the supply. Analyzing the share of domestic grape production from the supply, it can be observed that, in the period 2007-2013, the value was over 65%, this percentage indicating the volume of indigenous grapes on the domestic market. In the period 2014-2017 this weight ranged from 47 - 54%, considering that the domestic production recorded the lowest values of the analyzed period.

During the analyzed period, the average annual consumption of grapes per inhabitant increased by 3.68% annually.

With the help of consumption, relative to the resident population, it was possible to determine the total demand on the market, this registering an increasing annual average rate, of 1.73 %, contrary to the fact that the population of Romania is declining. This increase comes from the increase of the average consumption of grapes per inhabitant, which can be explained by the reorientation of

the population towards a healthier lifestyle, and due to the properties of this product.
Similarly, analyzing the share of domestic grape production, by demand, it is positioned, on average, for the entire period analyzed, just over 40 percent, respectively 42%, with the exception of 2007 and 2018, when there was a share of domestic production in demand of 70% and 51%.

CONCLUSIONS

Following the study it is found that both the areas of vines and total grape production fluctuated from year to year being influenced by various factors, from the restructuring of arable areas, the area of cultivation to the climatic factors and the yield of varieties. The supply on the grape market is insufficient and seasonal, this being supplemented by imports. Domestic production cannot cover the needs of consumers, given that it is limited, so that much of the demand for grapes on the market is purchased outside the country of Italy, Spain.
Although the population in Romania has a continuous tendency of decrease, during the analyzed period an increase of the total demand is registered. This being explained by the increase of the average consumption per capita, fact resulted by the reorientation of the population towards the healthy lifestyle, but also the increase of the standard of living that allows the purchase of agri-food products.

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THE INCIDENCE OF APPLE "*VENTURIA INAEQUALIS*" IN TRADITIONAL ORCHARDS OF FÂNTÂNELE VILLAGE, SIBIU COUNTY, ROMANIA

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Abstract

Venturia inaequalis is a known pathogen for long time as causing apple scab disease or black spots. The extent of the disease expression highly depends on apple cultivars, the presence in orchards of host plants of the pathogen, climatic conditions and agricultural practices. Today it becomes more important to broaden the access to more diverse genetic resources in order to improve the breeding programs including for apple varieties. The scope of this article is to analyse how much are affected apple trees by apple scab in the traditional orchards of Sibiu, Fântânele. These orchards are maintained without any pesticides, only traditional practices being applied for more than 30 years. Therefore, we consider that this hot-spot of apple diversity can be a valuable pool gene for further breeding programmes in Europe. Based on our results we can conclude that 'Belle de Boskoop', 'Winter Pearmain', 'London Pepping', 'Batul Alma', 'Edelborsdorfer', 'Boiken', 'Yellow Bellflower', 'Reinette Ananas' and 'Reinette Baumann' are among the best resisting cultivars against this disease. 'Golden delicious' is obviously the most susceptible apple cultivar against V. inaequalis.

Key words**:** *apple scab, Venturia inaequalis, traditional orchards, varieties under conservation*

INTRODUCTION

Venturia inaequalis causes important economic losses in apple production all over the world [3; 8; 19; 27]. In this regard we mention that according to FAOSTAT data, Romania provided official data to the FAO since 1961 and the today apple production is alike that of 1976. This is lower compared to official data collected in 1989 (i.e. the year when Romania entered democratic countries area) that was the highest in terms of trade and production, as well as the reference year for climate change. After 1989 the apple productivity and cultivation area in Romania continuously decreased [1]. Thus, it can be considered that apple production is today half of that of 1989 (i.e. from 697,400 kt to 339,570 kt) for an area that constantly diminished (i.e. from 84,864 ha to 55,600 ha). However, apple fruit is among the most important fruits in the world ranked the thirds at the global level. In this regard the EU production is covering almost all needs [2]. The external imports are around 493 kt for last year for the EU (USDA, 2018) [1]. In Romania case even nearly half (47.9 %) of those orchards' holdings were situated in three countries: Romania (18.7 %), Spain (16.5 %) and Poland (12.7 %) however Romania has no export market [1]. However, researchers are more interested in finding new tools and methods for improving the quality of apple genetics [6; 9; 20]. In the European Union is a group of specialists named: 'Malus Group' working on the inventory of apple collections in certain parts of Europe [18]. We consider that it is relevant for the scientists in Romania to provide a scientific background for our *on farm* collection of fruit trees that should be in line with the *Malus group* proposals, which is open for cooperation. We consider that the remains of traditional orchards inside the arch of Carpathian Mountains are valuable gene pools for apple breeding programme in Europe as it is considered in other studies [10]. The scope of this article is to analyse the presence and degree of infection of *Venturia inaequalis* into the traditional orchards from Sibiu, Fântânele in order to consolidate

scientific data for the recognition in Romania of traditional orchards as hotspot's habitats important for agro-biodiversity [1].

MATERIALS AND METHODS

Place of investigations: Fântânele (45°45'23" N and 23°55'28" E) is a small village positioned in Sibiu county which integrates in the rural area and agricultural land area traditional orchards for four types of landscape sub-units (Fig. 1).

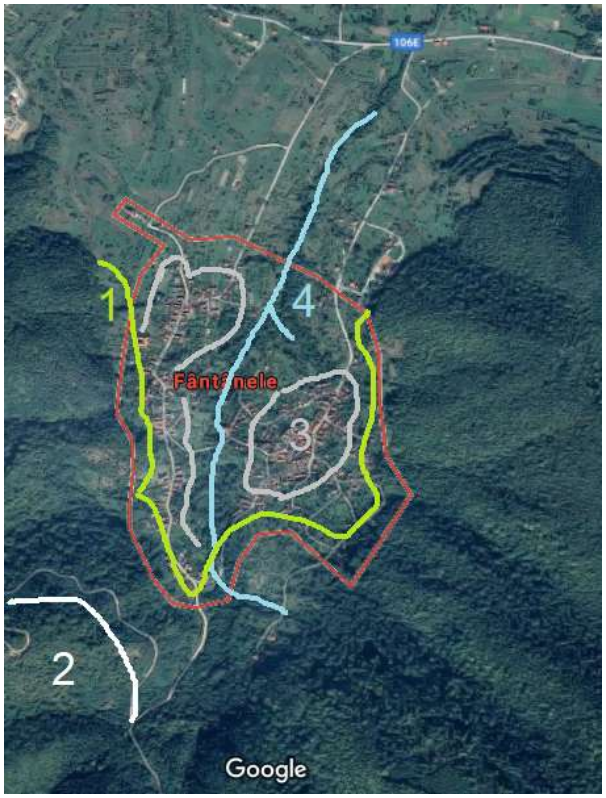

Fig. 1. Traditional orchards distribution within the landscape sub-units of Fântânele: 1- along the forest canopy area, 2- in the mountain at 1,000 m, 3 – inside the village and 4 – along the creek
Source: Image processed from *www.google.map* and modified by authors.

Methods of investigation

Venturia inaequalis is a fungal disease that can be observed as black / brown spots on the leaves and apple fruits.

Two field missions have been conducted in two consecutive years: 2016-2017 during September and covering 937 apple tree specimens into all four subunit-landscapes. Each mission duration took at least 7 full days.

Leaves infestation was realized by direct observation of the leaves into the trees (Fig. 1, upper image).

Degree of infection of apple fruits was realized in accordance to that described by Schwabe and collaborators (1984) such as following: 0 for no lesion; 1 for one lesion; 2 for 2 up to 5 lesions; 3 for 6 up to 10 lesions; 4 for 11 up to 20 lesions and 5 over 20 lesions. The calculation followed the mathematical formula developed by Townsend–Heuberger and adapted by Tinivella and collaborators [25] for fruits such as the following equation:

$$[\%\text{infection}] = \sum((n * v)/(i * N)) * 100$$

where:
v=class of infection defined as the degree of symptoms,
i=highest class of infection (5 in this case),
n=number of plants or fruits in this case,
N=no of total number of investigated fruits or 200.
The fruits were observed *on spot* without harming the trees (Fig. 2, bottom image).

Fig. 2. Jonathan' *Venturia inaequalis* attack on leaves of 'Jonathan' (upper image) and fruits of 'Poynik Alma' (bottom image)
Source: Original.

RESULTS AND DISCUSSIONS

The analysis of data recorded for 937 specimens belonging to 22 old apple varieties are discussed below, for each of the cultivars

'Batul-Alma', the second most popular apple tree of the region (i.e. 155 specimens recorded), presented an infestation percentage for the trees of 37%. However, only 5,25% of the infested fruits manifested a degree of infection of 1.06%. The cultivar is original from Transylvania and the long installation in the same ecosystem may further be relevant for the low fruits' infestation rate. These results are in line with other observations [13, 23].

'Belle de Boskoop' 38% of the investigated trees presented scab infection signs and 3.95% of the fruits were infested with a degree of infection of 1.86% (Table 1). They seem to be resistant towards this disease except for those trees located in the creek area where humidity is much higher during all year. From our investigations only 32 of the 84 specimens were infested and from 200 investigated apple fruits. It can be considered that these results are in line with previously published that stated among others that 'Belle de Boskoop' is less susceptible to infections [12].

'**Boiken'**, it is not a very often found cultivar as only 18 specimens have been recorded. All trees presented signs of leaves infestation and a media of 9.43% of the fruits are infested for an infestation degree of less than 2% (i.e. 1.88%). We mention that this variety is scattered over all landscape units and probably because it was popular in former times. As a novelty, the variety is rare in Europe and only few studies reported the degree of resistance against pests and not against scab [14].

'Edelborsdorfer' All 29 specimens were infected and 9.41% of the apple fruits. However, in terms of infestation degree this cultivar proved to be 1.17%. Some of the fruits were clean (0 degree of infection for 28%) and only 3% of the fruits presented a 2% degree of infection. The rest of the fruits presented a single up to 3 maximum spots of infestation. These results are supported by other studies published in the field [14].

'Golden delicious' is not very often found in orchards. All 21 specimens were infested with scab and all fruits expressed a maximum degree of infection of 5%. It can be considered that it is the most susceptible variety to scab in agreement with other authors [12].

'Gustav'. All 28 specimens identified in the field presented scab infection on their leaves. It appears to be susceptible to the infection even it was recorded in all landscape units from the mountain area (i.e. 1,000 m altitude) to the crick (i.e. 500 m altitude). However, when the fruits were analysed only 21% of them presented an infection degree of 2.01%. This may position the cultivar in the class of moderate susceptible cultivars to the scab [24].

'**Jonathan'** is the most appreciate cultivar in the region and all 205 specimens were infested. Over 45% of the fruits present a degree of infection of 5% proving that the cultivar is very sensitive to the scab [12; 26].

'**Local Baia Mare**' is a vigorous tree and 10 specimens have been recorded all infested with scab. 90% of the fruits expressed an infection degree of 5%. This cultivar is the most sensitive local cultivar to scab in Fântânele.

'**Local Cacova**' is considered as a rare and specific variety of the place. Only 2 specimens located in the village, both infested with scab expressed for more than 63% of the apples a media degree of infection of 2.03%. It can be considered that this red apple variety is susceptible to scab.

'**Local Florin**' All 29 recorded specimens were infested with scab. Over 57% of the fruits expressed a media degree of infection of 2.56%. The cultivar can be considered as susceptible to scab considering similar data for other cultivars such as 'Jonathan' or 'Starkrimson'.

London Pepping All tree specimens were infected and 4.25% of the fruits were infested with a degree of infection of 1.43% (Table 1). This result is relevant for the good quality of apple fruits compared to the rest of the fruits even all three trees were infected. Also, such an observation may further support that this variety may be relevant for further studies

regarding their resistance towards this disease. We also mention that the cultivar found in Serbia was also recently considered as moderate resistant [7].

'Nemes Sovari Alma' or **'Noble de Sovar'** is an old variety that is very often found in Transylvania. All specimens are infected no matter of the position into the landscape and 14 of the 49 specimens (i.e. 28.57%) also expressed the infestation at the fruits level with a degree of infection of 4.03%. These results are supporting other studies realized in Transylvania [16].

'Ponyik Alma' All recorded 86 specimens were infected with the scab at the leaves level. Also, 32% of the fruits were infected with a degree of infection of 3.23%. These are also very popular for this area and they are also vigorous trees. This variety is susceptible to the scab but at the fruit level it can be considered that there is a resistance against this fungus.

'Red Astrachan', is rare old variety for Romania territory, only one infected specimen with apple scab was found inside the village. The fruits analysis showed that infection was recorded for 21.25% that is around 2 the degree of infection (1.95). The variety is considered as moderate susceptible [21].

'Red Delicious'. All 27 analysed specimens presented signs of infestation at the leaves level. However, 26% of the apples were infected with a degree of infection of 5% (i.e. more than 20 spots/apple fruit). These results are further supporting other researchers results [4].

'Reinette Ananas'. This cultivar is present only in two exemplars. Both specimens were infected with scab and 14% of the fruits presented a degree of infection of 3.26%. However, 25% of the fruits presented a degree of infection of 1. This is a susceptible cultivar for the infestation with scab [17].

'Reinette Baumann' is also susceptible to this disease all 61 recorded trees presenting infestation signs on their leaves and fruits. However, only 15% of the apple fruits presented more than on single infestation spot on their surface. The infestation degree is likely to be 2.03% for the rest of the fruits. This variety was used for apple breeding studies in our country due to its potential in proving some resistance against this pathogen [22].

Table 1. Degrees of apple trees infections with *Venturia inaequalis* for different cultivars from Fântânele, Sibiu county Romania

Apple cultivar	Infested trees (%)	Infested apples (%)	Degree of apple fruits infestation (%)
Batul Alma	37	5.25	1.06
Belle de Boskoop	38	3.95	1.86
Boiken	100	9.43	1.88
Edelborsdorfer	100	9.41	1.17
Golden Delicious	100	100	5.00
Gustav	100	21	2.01
Jonathan	100	45	5.00
Local Baia Mare	100	90	5.00
Local Cacova	100	63	2.03
Local Florin	100	57	2.56
London Pepping	100	4.25	1.43
Nemes Sovari Alma	100	28.57	4.03
Poynic Alma	100	32	3.23
Red Astrachan	100	21.25	1.95
Red Delicious	100	26	5.00
Reinette Ananas	100	14	3.26
Reinette Baumann	100	15	2.03
Reinette Canada	100	40	3.24
Strakrimson	100	45	5.00
Winter Banana	100	46	4.41
Winter Pearmain	100	4.05	1.23
Yellow Bellflower	100	12.45	2.13

Source: original data.

'Reinette Canada' All 13 recorded specimens are infected with scab at the leaves level. The degree of infection of the fruits is 3.24 and covers 40% of all investigated fruits. This should be also due to ecosystems conditions as well as dur to the climatic conditions of the year. It is known also that this variety showed a moderate susceptibility towards scab [22].

'**Strakrimson'** is 100% infested for the 21 specimens recorded. 45% of the fruits are infected with a degree of 5. This was already described as a sensitive cultivar [5, 24].

'**Winter Banana'** is a rare cultivar found in orchards and all of them expressed the scab infestation at the leaves level. Over 46% of the apples were infected with a degree of infection of 4.41 proving that the cultivar even is susceptible however can be resistant at the fruit level [23].

'Winter Pearmain' All 44 specimens were found infested even they are occupying all

types of landscape units in Fântânele. However, only 4.05% of the apple fruits presented specific spots for a media of infestation of 1.23% per fruits. The cultivar it is recognized as susceptible to the infestation [11]. However, the low degree of fruit infestation may be considered that this variety can further hamper the pathogen development for each of the biological cycle step for a certain environmental condition.

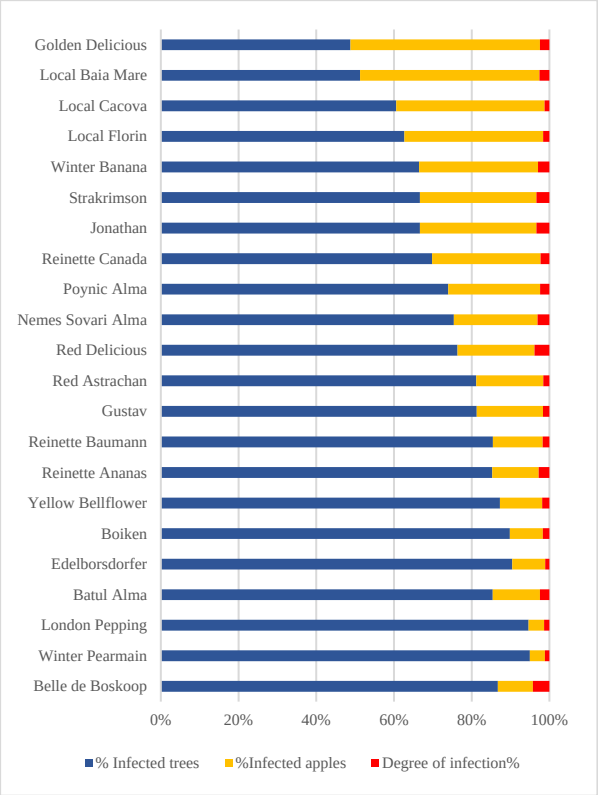

Fig. 3. Graphic representation of the degrees of apple trees infections with *Venturia inaequalis*. Recorded data are presented in the order of increasing resistance towards the apple scab.
Source: original data.

'Yellow Bellflower'. All 10 specimens were found infected with scab. 12.45% of the fruits presented a degree of infection of 2.13% (i.e. most of the fruits presented 4 or 5 scab spots). The cultivar was long time before considered as susceptible to this disease [15]. However, it can be considered that the installation of the cultivar in different landscape units, can rise some questions related to the degree of resistance and the evolution of this process during time.

It can be considered that at least four cultivars present only 5% scab infections for the fruits: 'Belle de Boskoop', 'Winter Pearmain', 'London Pepping' and 'Batul Alma'. They are followed by 'Edelborsdorfer' and 'Boiken' under 10% and up to 15% by 'Yellow Bellflower', 'Reinette Ananas' and 'Reinette Baumann'.

All these cultivars are very old and may represent for the future valuable genetic resources for improving the apple resistance against scab. On contrary the most susceptible to scab are 'Jonathan', 'Strakrimson' and 'Winter Banana' (i.e. over 45%) followed by local cultivars (i.e. 'Local Florin', 'Local Cacova', 'Local Baia Mare') and 'Golden Delicious' with the highest possible sensitivity to scab.

CONCLUSIONS

The analysis of these results showed that scab is present in all orchards of Fântânele and it is expressed on the leaves and /or the fruits. The scab is more active in the area of the creek and old varieties such as 'Belle de Boskoop', 'Winter Pearmain', 'London Pepping', 'Batul Alma', 'Edelborsdorfer', 'Boiken', 'Yellow Bellflower', 'Reinette Ananas' and 'Reinette Baumann' are among the most resistant cultivars towards this disease. However, the most susceptible cultivar remains 'Golden Delicious'. These results encourage us to consider that traditional orchards in Transylvania are relevant genetic pools for being accessed for the future breeding programmes in apple at the European level.

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TOOLS FOR ENSURING ECONOMIC SECURITY OF RURAL AREAS DEVELOPMENT

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Abstract

The authors elaborated structural and functional characteristics to provide the economic security of the development of rural territories. The authors identified the types of threats by: incompleteness of institutional environment, increased irrationalism of economic activities management, reduced economic prosperity of the rural population, degradation of the social sphere, worsening of demographic situation, destruction of the logistics infrastructure, aggravation of environmental imbalances. It is proposed to aggregate the economic security of rural areas development with demographic, economic infrastructure, rural households, social and humanitarian and environmental security. The authors compiled a rating of rural areas of Ukraine by the level of economic security. The tools to ensure the economic security of rural areas development are justified in the article.

Key words**:** *rural areas, economic security, tools, threat, risk, institution*

INTRODUCTION

Transformation processes and imperfect agrarian reform in Ukraine have resulted in the decline of agriculture and led to the exacerbation of problems of functioning of economic complexes in rural areas. They are marked by such negative trends as lack of jobs, poverty of rural population, decline in socio-economic, road, transport and household infrastructure, destruction of natural landscapes and the constant disappearance of rural settlements from the administrative map of the state. The rural population, especially the young people in rural areas, is significantly limited in the self-realization of their own plans and ideas in rural areas. It leads to the emergence of acute sectoral and spatial-territorial imbalances, that in the aggregate leads to a violation of the principle of a systematic approach to the management of security processes at all hierarchical levels of the national economy.

The aggravation of regional structural imbalances forms the prerequisites for increasing threats, strengthening the stagnation processes in rural areas and makes it difficult to establish the foundations of the ecological functioning of agriculture in Ukraine. Overcoming of these negative trends and processes requires the development of balanced tools to ensure the economic security of rural areas development that take into account their features, structural characteristics and the possibility of fulfilment of the natural resource potential in modern conditions of functioning of economic complexes in the rural territories.

MATERIALS AND METHODS

The results of studies on the issues of ensuring economic security at various hierarchical levels of economic management are reflected in the works of famous scientists. Thus, V. Horbulin and A. Kachynskyi assert economic security as the fundamental resource basis of the state to defend its national interests and gain strong stand at the geopolitical stage in the modern conditions of the distribution of strategic spheres of influence among the main players [4, p. 27]. The research of T. Vasyltsiv aimed to identify "the sectoral determinants of the formation of quantitative and qualitative parameters of the economic security of enterprises in the context of transformational processes of a market economy, taking into account the

sectoral specifics of economic management, as well as determining the nature of the interaction and the impact of the level of business security on the formation of government resilience to prevent risks and counter threats" [13, p. 10].

Z. Varnaly assigns the key role for the economic security of the state at the macro and meso levels to the legalization of economic relations that is based on the development of applied tools for reducing the size of the shadow economy, increasing the level of trust between the authorities and economic agents, eliminating the existing barriers to doing business transparently and paying taxes to the budget [12, p. 49].

In scientific papers on rural areas the attention of the authors is focused on theoretical and applied aspects of enhancing their socio-economic development. In particular, P. Cloke, T. Marsden and P. Mooney in their studies substantiated the mechanisms of reproduction of the natural resource potential of rural areas, developed the tools for introducing the technologies for greening the agricultural production, and developed measures to preserve the cultural and ethnic heritage among the rural population [2, p. 155-160].

A. Schmitz suggests the development of trade and economic relations in the rural area, system diversification in the agrarian sector of the economy, the introduction of innovative and savings management technologies, a decrease in the concentration of capital in one segment of the agrarian market to be the basic factors that reduce poverty among the rural population [9, p. 210-215]. The scientist V. Yurchishin asserts the rural territories as a spatial and resource base for increasing the efficiency of the agricultural sector's performance [14, p. 5].

Despite the presence of numerous scientific and practical developments, the scientist pay little attention to the problems of the formation of an appropriate level of economic security of rural areas development based on the creation of preventive mechanisms to counter the growing challenges and threats. Such preconditions ensured the formation of the goal of scientific research, which consists in justifying the instruments for ensuring the economic security of rural areas development.

Achieving this goal stipulated the expediency of creating an adequate set of research methods. The method of structural and functional analysis was used to carry out a classification of threats to the economic security of rural areas development.

The integral indicator of the economic security of rural areas development was calculated using the principal component method [11, p. 10]:

$$I = \prod_{i=1}^{n} z_i^{a_i}, \sum a_i = 1, a_i \geq 0 \quad (1)$$

where I – integral index of economic security; z_i – normalized indicator values; a_i – weighting coefficients; n – number of indicators.

The correlation between the primary signs and the components is described by such dependence in the model of the principal components [5, p. 30]:

$$y_i = \sum_{i=1}^{m} c_i G \quad (2)$$

where y_i – standardized values of the i-th component with unit variances; total variance is equal to the number of m attributes; c_i – the contribution of the i-th component to the total variance of a set of indicators [5, p. 30]. The G component is defined as:

$$G = \sum_{i=1}^{m} d_i x_i \quad (3)$$

where d_i – factor loadings; x_i – input data. In turn, the weight coefficients a_i are determined by the formula [5, p. 30]:

$$a_i = \frac{c_i |d_i|}{\sum c_i |d_i|} \quad (4)$$

The methodological approach to the separation of economic security zones was evaluated [6]: 1) 0-0.1999 – the critical zone; 2) 0.2000-0.3999 – the danger zone; 3) 0.4000-0.5999 – unsatisfactory area; 4)

0.6000-0.7999 – satisfactory zone; 5) 0.8000-1 – the optimal zone.

The method of system design was used to substantiate and develop effective tools to ensure the economic security of rural areas development. Such a combination of scientific research methods provided the possibility of obtaining the reliable results.

RESULTS AND DISCUSSIONS

Rural territories of Ukraine have significant natural resource potential, and the establishment of its rational use is the source of the formation of strong resource reserves of the state economic security system.

Rural areas occupy about 90% of the total area of Ukraine. 42.7 million hectares of agricultural land are concentrated in rural areas, accounting for 68.8% of the total area of Ukraine. As a result of economic activities in 2017, the share of agriculture, forestry and fishery in the overall structure of the gross domestic product (GDP) of Ukraine was 12.1% (US $ 13.5 billion), while the share of agricultural products in the export structure was 41.0% (US $ 18 billion) [10].

Despite the significant natural resource potential and the significant role of rural areas in the Ukraine's GDP, it should be noted that the efficiency and scope of their economic complexes functioning are insufficient due to the low level of involvement of this potential in business processes and managerial failures in the implementation of applied basic principles of state policy. Such tendencies deliver negative impact on the processes of formation of economic security at both the state and spatial-territorial levels, and also violate the principle of the consistency of its ensuring. This together leads to the intensifying of negative trends in the development of rural settlements in Ukraine (Table 1).

Catastrophic trends are noticed for the period 1990-2017 in Ukraine: urban-type settlements reduced by 42 units, villages – by 467 units, rural population – by 3.9 million people and its share in the total structure by 1.8%. 17 villages disappeared on average per year during the study period from the administrative-territorial map of Ukraine. Such destructive processes are caused by the exacerbation of stagnation tendencies in the countryside, the lack of jobs in sufficient numbers, the imbalance of the local government system, low social responsibility level and the unfair distribution of material benefits between the rural and urban population.

Table 1. Selected indicators of the development of rural settlements of Ukraine in 1990, 2000, 2010 and 2017*

Indicators	Year				2017 to 1990, +,-
	1990	2000	2010	2017	
Urban-type settlements, units.	925	893	885	883	-42
Villages, units.	28,845	28,651	28,457	28,378	-467
Rural population, million people	16.9	16.0	14.3	13.0	-3.9
Share of rural population, %	32.5	32.6	31.3	30.7	-1.8
Population per one village, people	584	557	504	459	-125

*Source: completed by the authors according to the data [3].

The growing influence of threats is the result of sharpening internal and external challenges, including the limitations of most natural (raw) resources, sharpening competition for resources, the risks of environmental conflicts [8, p. 70]. The following types have been identified, based on the compliance of the structural and functional aspect to the identification of threats to the economic security of rural development:

(i)threats of imperfect institutional environment (incompleteness and inconsistency of the legal framework, the prevalence of informal institutions over formal when making management decisions, excessive centralization of governance in rural areas; deformation of the institutional-psychological basis in rural areas);

(ii)threats of increasing the irrationalism of economic activity operation (inefficient use of the natural resources of rural areas, the distorted structure of agricultural producers, decay of the material and technical base of the agro-industrial complex; sectoral imbalances, low level of diversification of agricultural production);
(iii)threats to reduce the economic welfare of the rural population (excessive disparity of incomes of rural and urban residents, increased poverty and property stratification among the population, high level of unemployment, diffusion of the practice of the natural form of payment for leased land shares);
(iv)threats of social degradation (lack of a quality health care system, poor public services, stagnation of education in rural areas, decay of the cultural environment in rural areas);
(v)threats of deterioration of the demographic situation (gender and age structure imbalances of the rural population, the existence of spatial-regional demographic imbalances, migration of the rural population into urban areas, stagnation of human capital);
(vi)threats of destruction of the logistics infrastructure (abandonment of the road and transport communication; lack of development of cluster inter-farm interconnections; deterioration of communication networks; underdevelopment of information support in rural areas);
(vii)threats of aggravating environmental imbalances (increased human pressure on rural ecosystems, unbalanced use of natural resources, the occurrence of natural and man-made accidents and disasters, the destruction of rural landscapes).
The destabilizing effect of abovementioned threats complicates the processes of establishing the economic security of rural areas development and makes it impossible to ensure an adequate level of the latter. Taking into account the specifics, sectoral and regional peculiarities and existing structural and critical problems, the economic security of rural areas development is proposed to be aggregated from such components as:

(i)demographic security (determines the security parameters of the rural population reproduction from the point of view of their ability to level threats of deterioration of the age structure, exacerbation of depopulation problem, increase migration, deepening processes of "extinction" and "aging" of the demographic potential of rural areas);
(ii)economic and infrastructural security (characterizes the ability of economic complexes in rural areas to support the processes of expanded reproduction and form the economic capability of access to basic goods for the rural population);
(iii)security of rural households (determines the resource capacity of rural households to improve the quality of life and increase their own welfare on the basis of enhancing mechanisms to stimulate rural employment, diversify its income sources and improve the agricultural characteristics of these households;
(iv) social and humanitarian security (consists in the ability of the economic security system to support the most vulnerable groups of the rural population and ensure adequate conditions to meet their interests in the social and humanitarian sphere);
(v) environmental management security (characterizes the use of natural resources in rural areas from the standpoint of rationalism and environmental balance that allows to maintain the restoration capacities of the natural resource potential of rural territories at a safe level, to contain anthropogenic load on natural ecosystems within the maximum allowable limits and ensure the preservation of the latter for future generations).
A system was formed based on the theoretical and methodological generalizations with 47 indicators for assessing the economic security of rural areas development, aggregated into its integral index. To carry out the calculations, the software environment Statistica 10.0 (package "Principal Component Method") and Microsoft Excel 2016 were used. Table 2 presents the integral indicators of the economic security of the development of rural areas of Ukraine in 2012-2017 (Table 2).

Estimation of the economic security of rural areas development showed that during 2012-2017 its integral index was stably within the danger zone. The critically low level of this index is also observed in the regional dimension. Thus, an unsatisfactory level of economic security was recorded in seven administrative regions of Ukraine in 2017, and the rural territories of eighteen regions were within the danger zone. The highest level of economic security of rural development in 2017 was observed in Kyiv region, and Donetsk and Luhansk regions occupied the last places in the ranking. The results of diagnostics of the economic security of rural areas development give grounds to state the following: the system of the state's economic security is structurally imperfect and resource inconsistent to implement its functions not only at the macro- but also at the meso-level; threats to the economic security of rural areas development are poorly controlled and managed; the mechanism of transformation for increasing the level of efficiency in the functioning of the agro-industrial complex in the process of strengthening the economic security of rural development is insufficiently effective; the irrational nature management leads to environmental imbalances.

Table 2. Integral indices of the economic security of the rural areas development of Ukraine in 2012-2017*

Administrative regions	Year						2017 to 2012, +/ –	Administrative region's ranking, 2017
	2012	2013	2014	2015	2016	2017		
Ukraine	0.3517	0.3630	0.3702	0.3760	0.3844	0.3985	0.0468	–
Autonomous Republic of Crimea	0.3198	0.2687	–**	–**	–**	–**	–**	–**
Vinnytsya region	0.3358	0.3402	0.3397	0.3741	0.3873	0.3887	0.0529	9
Volyn region	0.4362	0.4372	0.4500	0.4648	0.4125	0.4235	-0.0127	3
Dnipropetrovs'k region	0.3281	0.3209	0.3704	0.3782	0.3446	0.3378	0.0097	17
Donets'k region	0.3181	0.3120	0.2779	0.2684	0.2838	0.2784	-0.0397	23
Zhytomyr region	0.3562	0.3388	0.3524	0.3463	0.3456	0.3578	0.0016	15
Zakarpattya region	0.3754	0.3699	0.3831	0.3702	0.3683	0.3745	-0.0009	12
Zaporizhzhya region	0.3131	0.3107	0.3061	0.3071	0.3010	0.3125	-0.0006	21
Ivano-Frankivs'k regiom	0.3619	0.3689	0.3863	0.4067	0.3977	0.4025	0.0406	7
Kyiv region	0.4514	0.4886	0.4890	0.4786	0.4848	0.4923	0.0409	1
Kirovograd region	0.3240	0.3431	0.3400	0.3325	0.3329	0.3345	0.0105	18
Luhans'k region	0.2789	0.2807	0.2748	0.2532	0.2673	0.2573	-0.0216	24
Lviv region	0.4052	0.3985	0.4249	0.4225	0.4100	0.4224	0.0172	4
Mykolayiv region	0.2964	0.3458	0.3484	0.3475	0.3297	0.3325	0.0361	19
Odesa region	0.2746	0.2862	0.2570	0.2760	0.2711	0.2843	0.0097	22
Poltava region	0.3923	0.4095	0.4187	0.4151	0.4219	0.4183	0.0260	5
Rivne region	0.3930	0.4028	0.4165	0.4179	0.4267	0.4347	0.0417	2
Sumy region	0.3639	0.3680	0.3712	0.3611	0.3809	0.3748	0.0109	11
Ternopil region	0.3472	0.3562	0.3806	0.3813	0.3868	0.4122	0.0650	6
Kharkiv region	0.3463	0.3503	0.3283	0.3405	0.3593	0.3654	0.0191	14
Kherson region	0.3029	0.3124	0.3219	0.3131	0.3054	0.3157	0.0128	20
Khmelnytsky region	0.3451	0.3516	0.3496	0.3397	0.3638	0.3784	0.0333	10
Cherkasy region	0.3613	0.3574	0.3656	0.3733	0.3630	0.3724	0.0111	13
Chernivtsi region	0.3585	0.3576	0.3703	0.3900	0.3888	0.3947	0.0362	8
Chernihiv	0.3267	0.3456	0.3389	0.3645	0.3498	0.3528	0.0261	16

*Source: completed by the authors according to the data [10].
** Statistical data are absent.

Improving the system of ensuring the economic security of the state at the meso-level involves reducing the influence of the informal institutions over formal ones in the development process [7, p. 10]. To do this, it is necessary to increase the management capacity of local governments by ensuring the systemic reform of local government taking into account the community opinion, peculiarities of territorial location and infrastructure

potential of rural areas. An important aspect is the improvement of the institutional support for the functioning of land relations in the agrarian sphere by reducing the uncertainty level of the future expectations of agribusiness entities about the strategic parameters for the development of these relations based on completing the land inventory, demarcating the land fund and defining clear boundaries of rural settlements. This will allow to create prerequisites for a phased launch of the agricultural land market with mandatory restrictions on the concentration of land within the use of one owner, as well as a ban on the acquisition of land rights by foreign and legal entities.

Improving the resource and functional capacity of rural areas requires justification of financial instruments to support the economic security of their development, that provides for improving the budget process on the grounds of the transition to medium-term budget planning, levelling the effect of the inflation component and overcoming bureaucracy in the allocation of funds; reducing the dependence of the budgets of village and town councils on transfers, by diversifying sources of financial income, strengthening the role of real estate tax and creating incentives for entrepreneurs to register and pay taxes at the place of business; unshadowing of operation through increase in control over the violation of the law, countering the concealment of the real scope of business output and increase the level of tax culture of the population.

The formation of organizational and economic instruments for ensuring the economic security of rural areas development is crucial, implying the following strategic orientation:

(i)to modernize the network of infrastructure facilities in rural areas on the grounds of public-private partnerships and introducing the practice of compensating for infrastructure losses due to the conduct of business at rural areas;

(ii)to develop program-investment support for technical and technological re-equipment of economic entities of the agro-industrial complex, primarily small and medium-sized agricultural enterprises, on the grounds of innovation and leasing, strengthen incentives for the development of cooperatives through the mobilization of resource potential, provide economic incentives for the transformation of households into farms on the basis of increasing their marketability;

(iii)to ensure the harmonization of domestic standards for ensuring the quality and safety of food with the requirements of EU member states by eliminating bureaucratic barriers and simplifying product certification procedures, creating preventive mechanisms to prevent exceeding the maximum permissible norms of harmful substances in food products, improving information support for producers of agricultural products in terms of requirements and provisions of the EU food regulations;

(iv)to intensify the diversification of risks of economic activities in rural areas, by stimulating the development of organic farming, increasing production capacity in the livestock industry, forming closed production and processing cycles, stimulating the development of rural green tourism, forestry and wood processing, fisheries, services and trade, alternative energy [1, p. 27-30].

Ensuring an adequate level of economic security of rural areas development is impossible without solving social problems, which requires the formation of socio-psychological instruments. For this, it is necessary to implement a set of measures aimed at creating a favourable institutional and psychological basis in rural areas and overcoming the destructive influence of the deviant behaviour of rural residents through the development of civil society institutions, overcoming the inert thinking of the rural population, searching for leaders and developing a sense of responsibility for village development, the revival and preservation of cultural customs and traditions.

The normalization of the demographic situation requires systemic measures. It involves overcoming the destabilizing tendencies of stagnation of human capital and the decline of the labour market in rural areas through balancing the age and gender structure of the rural population, creating favourable

conditions for living in rural areas, satisfying basic interests and needs, forming effective motivation for young people to return to their native village and living there after completing their studies, using acquired knowledge and skills for the development of the rural areas through the implementation of their own projects through entrepreneurial initiatives format, the establishment of mechanisms to overcome negative migration processes.

The strategic priority in the system of ensuring the economic security of rural areas development is the implementation of environmental instruments, that implies a focus on the introduction of environmentally friendly technologies; harmonization of human business activities with the functioning of natural ecosystems of rural areas, preservation of the reproductive properties of the natural potential of rural areas, cleaning polluted regional spatial areas, preserving and protecting the natural resource potential of rural areas from destruction for future generations, greening energy capacities on the basis of the development of alternative sources of energy through the usage of the natural resource potential of rural areas.

CONCLUSIONS

The rural areas of Ukraine are characterized by depressive development due to the destabilizing effect of risks and threats on the processes of ensuring their economic security. The unformed system of tools for ensuring the economic security of rural areas development is caused by the declarative nature of government programs for socio-economic development, resource scarcity of the public administration system, its imbalance at various hierarchical levels, the second-ratedness of solving rural areas development problems. To increase level of the economic security of the development of Ukraine's rural areas provides for the expediency of systemic implementation of a set of tools, including institutional (improving regulatory and legal framework, completing local government reform, adjusting land relations), financial (improving the budget process, diversification of financial income sources, unshadowing economic activities), organizational and economic (development of infrastructure facilities, technical and technological re-equipment of agribusiness, diversification of economic activities in rural areas), social and psychological (normalization of the demographic situation, improvement of the human capital quality, preservation of culture, customs and traditions), environmental (use of environmentally friendly technologies, the introduction of non-waste production, the development of alternative energy). The implementation of these tools will ensure the formation of resource reserves for levelling the disproportions of spatial and territorial development, improving the quality of life of the rural population and establishing the foundations for rational environmental management. All this will transform into a segment of strengthening the economic security of rural areas development.

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THE BONITATION METHOD FOR ASSESSING THE FERTILITY OF THE CHERNOZEM

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Abstract

The theme of this paper is to obtain information on soil fertility characteristics of Chernozem soil to determine the general production capacity of the land for different crop plants. The present state of the complex system of soil properties, relief, climatic conditions, geomorphology, the types of agricultural farming practices and land use, are all contributing to loss of soil fertility with all its negative impacts on the environment. For this purpose, the calculation of Bonitation Note (NB) (soil quality index, bonitation score) is determined on the main agricultural crops according to the natural fertility capacity of the soil. The natural bonitation score is calculated based on the soil characteristics, which is assigned to the coefficients from 0 to 1, depending on the preference given by each characteristic. The studied Chernozem, located in the southeast of the Romanian Plain, more precisely in the Baragan Field, is directly investigated with the environmental factors, which together form homogeneous ecological territory units (UT), these UT having specific advantages at various agricultural uses, such as wheat, corn, sunflower, peas and soybean crops. Following a pedological study, Chernozem is in the second quality class, with 72 points, of the maximum of 100 points. Because this assessment of soil is changing under the influence of natural environmental factors and human intervention, the bonitation score must be permanently updated.

Key words**:** *soil, evaluation method, quality index, bonitation, chernozem*

INTRODUCTION

The soils in the Baragan Plain subdivision of the Romanian Plain are fertile varieties, belonging to the Cernisoluri Class, with increased productivity, but suffering from moderate climatic conditions and solid texture, which have a tendency of permanent degradation due to these limiting factors.

It is known that the negative influence of climatic factors, relief, hydrology and edaphic characteristics affects about 80% of Romania's arable land [2].

In our country, the land quality assessment is is determined by calculating the Bonitation Note (BN), thus assigning to each type of soil, a characteristic mark depending on its fertility. By means of this rating, a balance of expenditure per hectare and of the overall income is achieved, with grades 1-3 being preferred, but they are found only in fertile soils [16].

In the case of soils with scores of less than 45 points - as an average calculated for arable - negative economic results are obtained. The average level of a point of qualification is independent of the fertility class, but it varies according to the applied technology from 5.5 lei/point to 7.7 lei/point.

In the case of arable land, which occupies 63.4% of the country's agricultural area, most of the plots are grouped in the II nd quality classe (28.69%), III rd (38.19%), and in I st grade class only 6.7% of the total land, the rest of the classes having different restrictions [5].

Maintaining soil quality in agriculture depends on the use of soil and agricultural practices [6].

The bonitation notes thus obtained highlight aspects related to the quality of the land, the suitability for various uses and the production capacity expressed in kg/ha, and a series of limiting factors that affect the production capacity of agricultural land in within the studied territory, such as drought and fine texture [10].

MATERIALS AND METHODS

The land bonitation of the agricultural land was calculated on the basis of the calculation of the Bonitation Note, according to the quality indicators for the chernozem substrate type, after which the identification of the limiting factors of the agricultural production was made and the corresponding quality class was made [17].

The bonitation for arable land (BN) was calculated for agricultural crops, which are of the highest favorability in the Romanian Plain, based on bonitation indicators, according to "The Methodology of Performing Pedological Studies" [15].

For soil characterization, the Homogeneous Environment Territory (TEO), as defined by Teaci, [15] was followed by morphological, hydrophysical and chemical indicators such as texture, useful edafic volume, bulk density, total porosity, degree of galling, pseudogleization degree, salinity intensity, $CaCO_3$ content, pH, saturation in bases (V%), humus content in Ap and up to 50 cm, respectively, average temperature and precipitation in the area.

The 17 rural and environmental indicators have been included in the agricultural land, which in turn are characterized by a coefficient ranging from 1 to 0. These values vary depending on the intensity of the limiting factor, 1 = very favorable and 0 = unfavorable [18], [13], [14].

For each indicator, for each crop, there are standard tables that include the respective coefficients (both for natural conditions and for potentiated conditions).

The formula for evaluating the land mark for a particular crop is the following (1):

$BN = (X_1 \times X_2 \times X_3 \ldots\ldots \times X_{17}) \times 100$, where: $X_1 \rightarrow X_{17}$ - the value of the coefficient of the eco-pedological index.

For the calculation of the bonitation, I referred to the most important characteristics of the soil, namely: flooding; gleization; average annual precipitations; depth of phreatic water; humus; stagnogleyzation; pollution; salinization; useful edaphic volume; texture in Ap; slope; landslides; total porosity in restrictive horizon; total $CaCO_3$; pH; average annual temperature and stagnant humidity excess [12].

The natural bonitation note is expressed in points, with values from 1 to 100 and is calculated on homogeneous ecological territory units (TEO) for the category of use existing at the time of cartography [11]. The bonitation score has classified the soils in 5 quality classes: Class I between 81 and 100 points; Class II between 61 and 80 points; Class III between 41 and 60 points; Class IV between 21 and 40 points; Class V between 0 and 20 points [9].

For the arable land use category, the natural scoring grade was calculated as the arithmetic average of the 6 - crop - rating marks at the parcel level on an area of 670 ha, these being: FS - sunflower, SO -soybean, MF - peas - beans, PB - corn, OR - barley, GR - wheat, these being the predominant cultures in this area.

RESULTS AND DISCUSSIONS

Starting from the definition of complex soil data by Roman researcher, N. Florea, he defines the soil, as a structured, complex, polyphase, open and polyfunctional system and defines the soil "the product of the transformation of mineral and organic substances from the surface of the earth crust under the influence of environmental factors over a long time, characterized by a certain organization and morphology; it is the environment for the development of superior plants and the basis of living for animals and humans" [4].

On the other hand, the soils are considered natural bodies, consisting of mineral components and organic living organisms, interacting with physical attributes, chemical, biological and morphologically different from those of the parent material from which it formed.

They contain four main constituents, which are in 3 phases of material aggregation: solid, liquid and gaseous [3]:

- the mineral constituents of rocks (from basalt, granite to sandstone, sands or clay),

which constitute 45% of the soil „skeleton" [8] and the organic constituents with a biologic origin (biomass composed of about 50% cellulose, lignin, amino acids, proteins, waxes and pigments) in a proportion of 5%;
- the liquid components (water and solutions) in the proportion of 25%;
- the air (gas and water vapor), which occupies 25% of the soil's mass.

The components of soil liquid and gas are between 15% and 35%, depending on the soil moisture. These solid and liquid constituents are complementary and influence each other, providing the environment necessary for the development of plants and livestock in the soil [15].

The land taken into the study is chernozem on arable and is found in the Baragan Plain. Chernozems are soil specific to the plains, in the surveyed region they occupy 75.9% [1]. Territorial distribution and soil class is conditioned by the main rescue units and climatic conditions, and soil types and subtypes, especially for relief forms, riverine and groundwater or parental rocks [7].

From the climatic point of view, the studied territory is a continental climate specific to the Baragan Plain. The summer is characterized by a dry and warm climate due to the influence of hot and dry continental air, and temperatures reach over 26^0C in July and reach more than 40^0C - 42^0C in August.

The autumn is relatively dry, with very little rains and the winters are cold, with strong blizzards and late spring frosts, which have a destructive effect on the roots of the crop plants.

The chernozem (SRTS-2012), is represented as a continuous east-west stripe strip parallel to the Danube where the processes of leaching and alteration are intense [5].

The soil was developed on parental loess and loessoide deposits and the groundwater was more than 10 m deep. The well-developed grassy vegetation cover leaves a large amount of vegetal remains in the soil, rich in humic acids of the calciferous type.

The soil profile is of the type, (Fig. 1):

Am - Bt_1 - Bt_2 - BC – Cca

Fig. 1. Soil profile, chernozem, Calarasi area.
Source: Own research.

The superficial horizon is of mollic type (Am), has a well developed glomerular structure and structural good condition, the texture is dusty argile clay, firm, plastic, adherent, moderately compact and without iluvial characters.

Horizon B textural (Bt) is at a depth greater than 40 cm, gray-brown to very dark (10YR3/2) in the wet state, polyhedron structure, firm, plastic, is a iluvial the bottom with a high content of clay fine polyhedron structure and less compacted, is up to 100 cm thick.

The horizon Cca, presents texture clay loam dust, dark yellowish brown (10YR4/5) in the wet state and starts at more than 130 cm and containing calcium carbonate ($CaCO_3$).

The texture is undifferentiated on the profile, medium to fine, the glomerular structure, and porosity and aerohydricity are good.

The humus content is higher, reaching 4.5% in Am and high in the calcium mull type.

The degree of saturation with bases (V%) is 92.6 % and pH 7.9.

Physical properties are characterized by medium porosity and permeability, increased microbiological activity and nutrient supply favorable to plant growth.

Table 1. Field Unit Card, Chernozem

Nr. crt.	Soil characteristics	UT	
		Name	Symbol
1.	Soil class	cernisol	-
2.	Soil type	chernozem	CZar
3.	Parent material groups (ind.21)	loess	-
4.	main relief form ind 2	plain	C
5.	Slope, ind.33	3	IP01
6.	Flooding, ind.38	absence	f00
7.	Texture (in horizon A) ind.23	loamy clay	T
8.	Content in skeleton, ind.24	poor skeletal soil	q1
9.	Physiologically useful volume, ind. 133	shallow	d1
10.	Soil reaction (in horizon A) ind.63	7.9	pH071
11.	Humus content (in horizon A) ind.144	4.4	%
12.	Degree of gleization, ind.14	non gleization	G0
13.	Degree of pseudo gleizing, ind.15	poor stagnogleizat	W1
14.	Degree of salinization ind.16	Non-salinization	S0
15.	Degree of alkalinity, ind.17	Non-sodicity	A0
16.	Deep of ground water, ind. 39	small	Q4
17.	Waterlogging, ind.40	absence	I0

Source: Own calculation.

Table 2. Calculation sheet of the natural bonitation notes at TEO level - Chernozem

Nr. crt.	Indicatory and code	Value	TEO1	TEO2	TEO3	TEO4	TEO5	TEO6
			The coefficients for agricultural crops					
			GR	OR	PB	MF	FS	SO
1.	Annual mean of temperature, code 3 C (0^oC)	11.28	1	1	1	1	1	1
2.	Annual mean of precipitations, code 4 c, mm	517	1	1	1	1	1	1
3.	Ggleyzation degree, code 14	Absence gleization	1	1	1	1	1	1
4.	Pseudogleyzation degree W, code 15	poorly stagnated	0.9	0.9	0.9	0.9	0.9	0.9
5.	Salinization and alkalinity S/A, code 16 or 17	no salinized	1	1	1	1	1	1
6.	Texture (horizon A), code 23	clay - argil	1	1	1	1	1	1
7.	Pollution, code 29	Absent pollution	1	1	1	1	1	1
8.	Slope, code 33 (%)	3.2	1	1	1	1	1	1
9.	Landslides, code 38	absent	1	1	1	1	1	1
10.	Deep of ground water, code 39, m	8.3	0.8	0.8	0.8	0.8	0.8	0.8
11.	Flooding, code 40	absent	1	1	1	1	1	1
12.	Total porosity, code 44, %	69	1	1	1	1	1	1
13.	$CaCO_3$ content, code 61, %	10.2	1	1	1	1	1	1
14.	Soil reaction, code 63	7.8	1	1	1	1	1	1
15.	Physiologically useful volume, code 133, %	82	1	1	1	1	1	1
16.	Humus, code 144 %	4.4	1	1	1	1	1	1
17.	Waterlogging , code 181	poor	1	1	1	1	1	1
18.	**NATURAL BONITAGE NOTE**		**72**	**72**	**72**	**72**	**72**	**72**

Source: Own calculation

Gr = Wheat; OR = Barley; PB = Corn; MF = Bean - peas FS = Sunflower; SO = Soybeans.

Land Unit (UT) characterization based on Bonitation Indicators.

The characters of the horizons described above are diagnostic characters for the Bonitation Note and are appreciated as a whole.

They are characterized in terms of soil conditions, topography and drainage as per Table 1.

Indicators used (either directly or indirectly) for natural bonitation and the analysis of restrictive factors are presented in Table 2 and have the following values, which in the case of chernozem substrate are identical for all cultures:

Bonitation indicator calculation:
BN = (1 x 1 x 0.9 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 1 x 0.8x 1 x 1 x 1 x 1 x) x 100
BN = 72 points,
(identical for all crops)

The average bonitation note for arable grade in the 6 cultures studied on a clay subtype chernozem is 72 points and is calculated from the average of crops: wheat, barley, maize, sunflower, soybeans and bean - peas (this is cultivated more rare on the farm).

The 72 bonitation points, obtained on the type of chernozem subtype soil type, fit these land into Class II quality.

The production limitations on these lands are due to the depth of groundwater, which is at a deep depth, and in dry periods, water can not flow through capillarity to compensate for the water scarcity in the soil, to which the droughts during the year contributes greatly as well.

CONCLUSIONS

The 72 bonitation points, obtained from calculation the Bonitation Note, obtained on chernozem soil type, within these lands in the second grade of quality.Class II lands are of good quality, with soils that are in early stages, poor degradation processes (stagnogenization), lands with a small slope of up to 4%, which can be used for landscaping and drainage excess water, respectively increase of soil fertility.

These lands could be classified as class I, but have the above mentioned limitations or degradations, such as stagnogenization and groundwater depth.

The range of crops on these lands is very wide, ranging from wheat, corn, rapeseed and even sunflower oil that is well suited to this area, but there are limitations due to climatic conditions (dry climate and late spring frosts).

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THE DYNAMICS OF SOCIAL MUTATIONS IN RURAL AREAS OF TULCEA COUNTY, ROMANIA

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Abstract

The aim of the paper is to analyse the dynamics of social mutations that took place in the rural area of the Danube Delta, in Tulcea County, which is part of the interest area of the project. Statistical indicators have been determined using the functions from Excel Program, such as: average, standard deviation, coefficient of variability, annual growth rate. Population in rural are of Tulcea County had a decreasing trend during the period 2012-2018 and reached in 2018 at 53.5% of population of the county. The coefficient of correlation between emigrants and population in rural areas of the county of Tulcea indicate a very good association between the two variables and determination coefficient R^2 shows that 86.32% of the variation of resident rural population can be explained by linear relationship with the number of temporary emigrants. The population employed in agriculture, as the main activities of the rural area, decreased in the period 2008-2017 by almost 26%. Although the population occupied in agriculture is 10 times higher than in tourism, the upward dynamics of the tourism sector creates the premises for economic growth.

Key words**:** *population, rural, tourism, emigrants*

INTRODUCTION

Tulcea County belongs to the Romanian South-East Development Region and on its surface there is one of the best preserved of the European Deltas - the Danube River Delta.

Due to the physic-geographic conditions and the high water sprawl, the population is concentrated in rural settlements, located along the Danube, and the predominant activities are those related to fishing and agriculture [9].

The available statistical data indicate, overall, an unfavourable evolution of the social mutations in the rural area, at Tulcea county level. As we will see, these changes were based on both negative indicators on the natural increase of the population, which had only negative values during the studied period, but also the emigration of persons.

MATERIALS AND METHODS

Following statistical data from National Institute of Statistics and other sources mentioned in the study, various statistical indicators were calculated using the functions available in the Excel Program, such as: *average, standard deviation, coefficient of variability, Pearson correlation coefficient, coefficient of determination, annual growth rate*.

The results obtained were illustrated graphically using the applications in Excel Program.

RESULTS AND DISCUSSIONS

According to sources of statistical information, the total resident population of Tulcea County decreased by 6.7% between 2012 and 2018, reaching 197,754 persons. Population in rural areas of Tulcea County represented 53.3% of county's population in 2012, and 53.5% in 2018, meaning that rural areas are prevailing in the county.

This followed the same downward trend (-6.3%) between 2012 and 2018, reaching 105,848 persons (Fig. 1).

Fig. 1. Resident population in Tulcea
Source: National Institute of Statistics (NIS) [6]

Statistical indicators determined indicate the same variability of the population, both in county and in the rural parts of the county (Table 1).

Table 1.Statistical indicators of resident population in Tulcea County

Specification	Average	Standard deviation	Coefficient of variability %
Total	205,442.7	4,780.3	2.3
Rural	109,730.3	2,560.1	2.3

Source: Own calculations.

From a local perspective, the knowledge of the resident population is important in planning and implementing policies for resource allocation, infrastructure development, strategic investment, building social units [7].

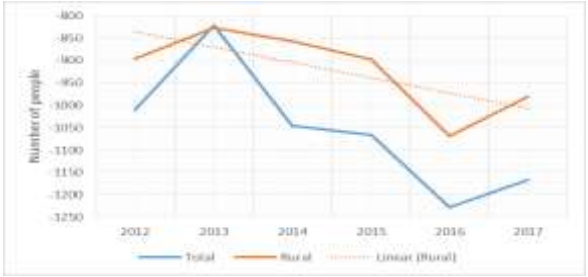

Fig. 2. Natural growth of population in Tulcea County
Source: NIS [6].

The natural increase of population in Tulcea had only negative values, both overall and rural, and the tendency was generally downward, with the exception of the year 2017, when the decline diminished (Fig. 2). Natural growth is a dimension of demographic and genealogical power of population [3].

With respect to average yearly growth rate of population at rural areas of Tulcea county level, this indicator is only negative in the period studied, between minus 0.8% and minus 1.6%, showing a continuous decrease of residents (Fig. 3).

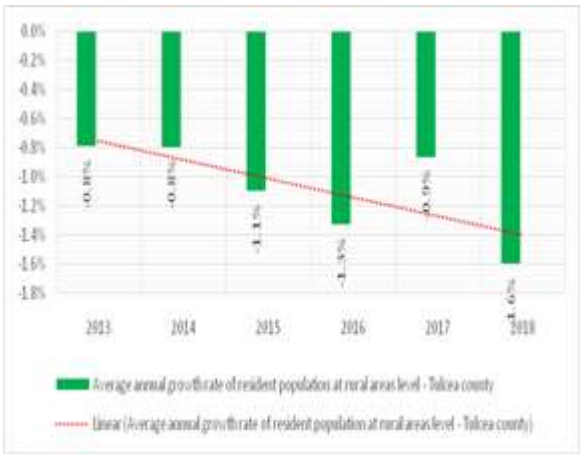

Fig. 3. Average annual growth rate of population at rural areas of Tulcea county level
Source: Own calculations

The correlation coefficient of 0.78 between the natural population growth and the total resident population in Tulcea county shows a very good association between the two variables and the coefficient of determination of 0.6057 shows that 60.57% of the gradient of resident population is due to direct relation with the native increase of the population (Fig. 4).

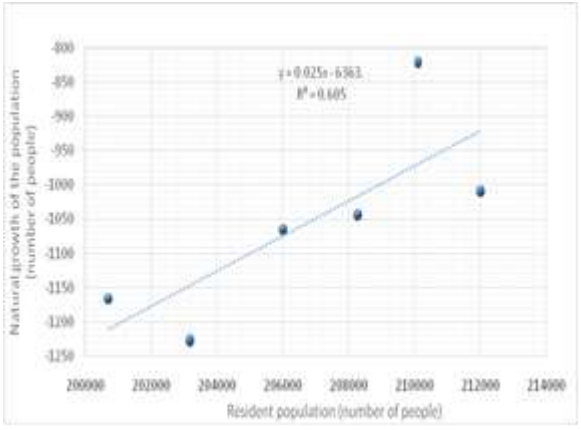

Fig. 4. Relation between natural increase of population and resident population
Source: Own calculations

The Pearson correlation coefficient of 0.77 between the natural population increase in the rural parts and its number indicates a very good association between the two variables and the R^2 determination coefficient of 0.5879 shows that 58.79% of the variation of the resident population in rural parts can be explained by direct relation with its the natural growth.

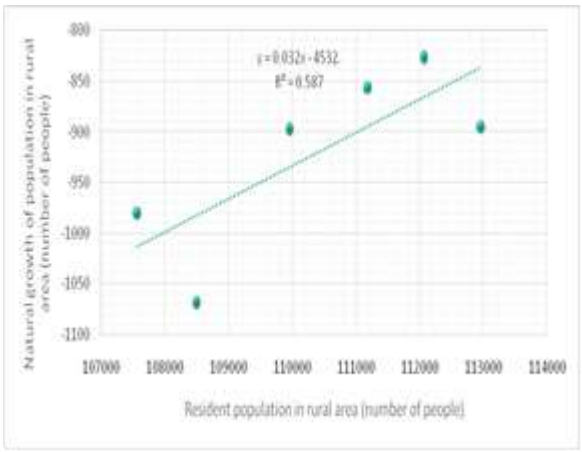

Fig. 5. Relationship between natural growth of rural population and its number
Source: Own calculations.

Population migrations had a two-way upward trend, emigration being larger than immigration: the migration stream consisted of hundreds of people and immigration - dozens of people (Fig. 6 and Fig. 7).

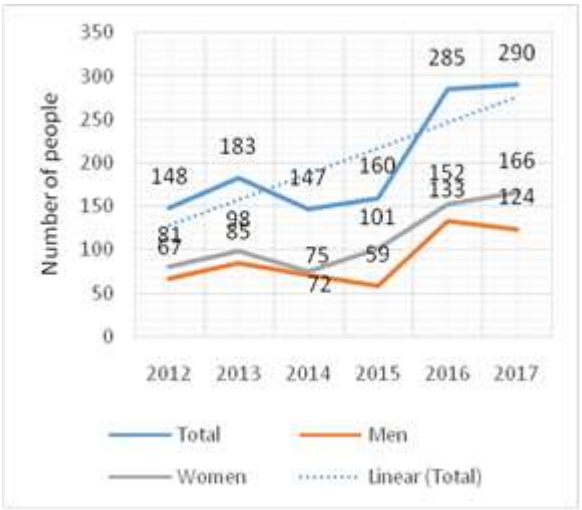

Fig. 6. Permanent emigrants from Tulcea County
Source: NIS [6].

Thus, in 1990, the definitive emigrants were 95 and increased to 290 in 2017. By gender, women generally emigrate more than men, and immigrants comprise more men than women.

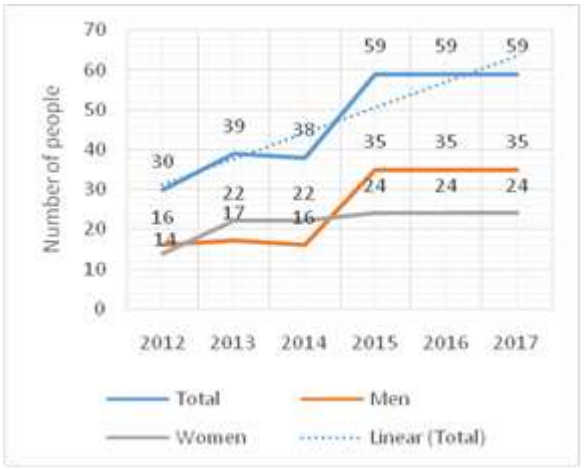

Fig. 7. Permanent imigrants in Tulcea County
Source: National Institute of Statistics [6].

The map of temporary emigrants in Tulcea illustrates an increase in the studied period, both overall and rural, but more pronounced in rural areas by 15.3% -16.7%.
The rural losses population through migration (Fig. 8).
Emigration is based on the search for life solutions and has as result the supplying of an intermediate European social class, absorbed by large migratory waves in search of a job [3].

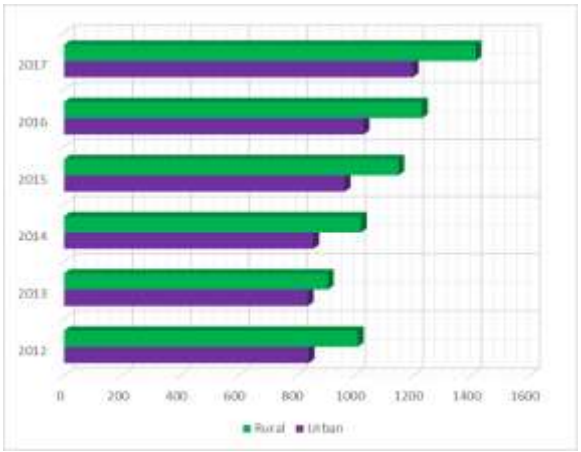

Fig. 8. Temporary emigrants in Tulcea
Source: NIS [6].

Coefficient of correlation of - 0.93 between emigrants and rural population of Tulcea shows a very good linkage between these two variables and the coefficient of determination of 0.8632 shows that 86.32% of the variation

of rural population is a result of a direct linear relation with the emigrants number (Fig. 9).

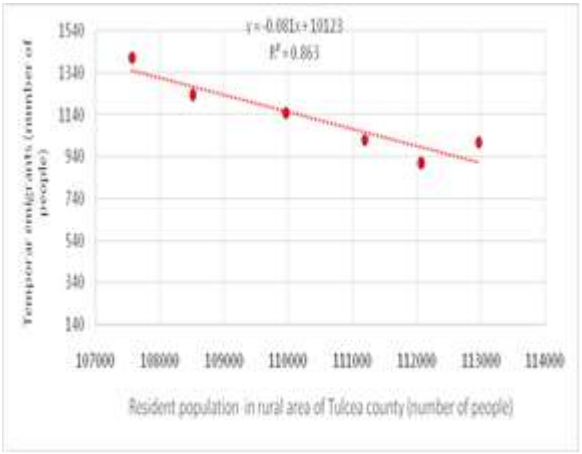

Fig. 9, Relation between temporary emigrants and resident population in rural area of Tulcea County
Source: Own calculations

The population employed in agriculture, forestry and fishing in Tulcea County, as the main activities of the rural area (Fig. 10) decreased in the period 2008-2017 by almost 26%, reaching 22.6 thousand persons, while the population occupied in hotels and restaurants (tourism) (Fig. 11) is steadily increasing, from 1.6 thousand people in 1992 to 2.3 thousand people in 2017 (+ 43.7% between 1992 and 2017).
As we can see in the Table 2 attached to Fig. 10, the average growth rate of the period is negative, -6.3%, and the coefficient of variability calculated is 14.5%.
According to Eurostat data, Romania occupies the first place in Europe with regard to population occupied in agriculture.

Fig. 10.Population occupied in agriculture in Tulcea
Source: NIS [6]

Table 2. Statistical indicators - population occupied in agriculture in Tulcea

Year	2012	2013	2014	2015	2016	2017
Population occupied in agriculture, th. people	31.6	29.9	29.1	25.6	22.4	22.6
Average annual growth rate		-5.4%	-2.7%	-12.0%	-12.5%	0.9%
Average growth rate of period	-6.3%					
Average population	26.9					
Standard deviation	3.9					
Coefficient of variability, %	14.5					

Source: Own calculations, following NIS data.

The predominant agricultural areas where the human resource is depleted are confronted with a lack of resources, low income per capita, and insufficient labour productivity.
Low productivity negatively affects the progress of agricultural sector and its potentialities to concur to the economic growth of the region [5].
Often the population migrates first from villages to large urban centres, before leaving the region itself [1].
In the Table 3, the medium growth rate of the population occupied in hotels and restaurants domain in Tulcea county, in the period under study, was 12.3%, which suggests an increasing interest for this domain of activity, and also a high variability, of 20.9%, which shows an increased dynamics of the tourism.
Though the population in agriculture is 10 times higher than in tourism, the upward dynamics of the tourism sector create the premises for economic growth.
The existence of real opportunities for the area in this area should take into account the multiple ways of capitalizing domestic and international tourism resources.

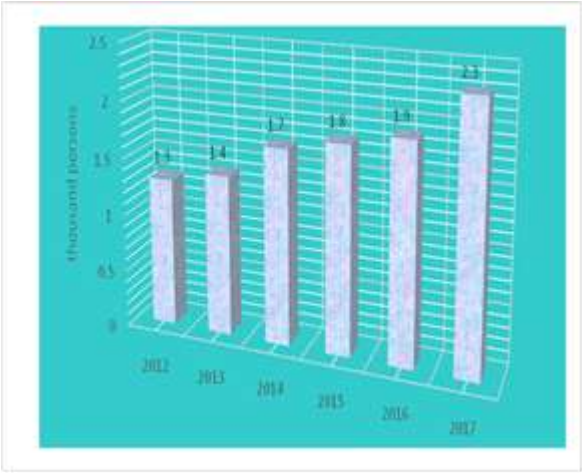

Fig. 11. Population occupied in hotels and restaurants domain – Tulcea County
Source: National Institute of Statistics [6].

Table 3. Statistical indicators - population occupied in hotels and restaurants – Tulcea

Year	2012	2013	2014	2015	2016	2017
Population occupied in agriculture, forestry and fishing, th. people	1.3	1.4	1.7	1.8	1.9	2.3
Average annual growth rate		7.7%	21.4%	5.9%	5.6%	21.1%
Average growth rate of period	12.3%					
Average population	1.7					
Standard deviation	0.4					
Coefficient of variability, %	20.9					

Source: Own calculations, following NIS data.

Tourism in Tulcea County focuses on its natural landscapes and rich history. Crossed by Danube waters, Tulcea County has a sensitive scenario in the Danube Delta, which is the largest European Delta so well preserved.
In order to point out the natural landscapes, there are the rustic villages, where the people live and keep for hundreds of years the traditions [10].

CONCLUSIONS

The human factor is essential for economic and social progress. Thus, three determinants of economic growth are considered: labour growth, capital stock growth and technical progress.
In addition, there is a trend to expand the number of factors of economic growth, including education or training level, R & D spending, foreign trade, foreign investment volume, etc. [2]
Having in view the decline of population in agriculture of Tulcea and the increase in tourism, the outlook of a regional progress policy aimed at the absorption of the labour force in tourism and agro-tourism development of the county is needed. Mobility in the employment structure reveals for Tulcea County a modest growth of the services sector, namely tourism.
Considering the agricultural potential of the area, the two areas can converge in an optimal direction: agro-tourism that capitalizes the local resources [4].
Attracting investment also implies a quality of workforce through the complexity of technologies. To increase investment in the area, macroeconomic stability, infrastructure and human resources are needed [8].

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THE DRY MATTER ACCUMULATION IN THE WINTER WHEAT ONTOGENESIS ON THE CALCAREOUS CHERNOZEM UNDER MINERAL FERTILIZERS ACTION

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Abstract

The weather conditions of the agricultural years 2015-2016 and 2016-2017 according to the rainwater regime were characterized as wet and very humid years. The administration of mineral fertilizers on the calcareous (carbonatic) chernozem showed the dependence of the dry substance accumulation on the winter wheat ontogenesis with the weather conditions. In the beginning of the straw stretch development phase of the winter wheat the most intense process of dry matter accumulation was determined. The dry matter accumulation was 3-4 times higher than in other plant development phases or 65% on average. The development phase of winter wheat with maximum organic mass accumulation was flowering, both for the control and fertilized variants. In the years with insufficient precipitation on the variant with dose rate $N_{60-120}P_{3.5}K_{60}$ were occurred the delay of the maximum phase of organic substance synthesis until the milk-wax phase of wheat plants. The experimental data showed that the optimal variant with dry accumulation matter in the wheat plants was the dose $N_{60}P_{3.5}K_{60}$. In the control variant, the dry matter content of the plant in the twinning phase consisted of 6.5 g on the 100 plants and increased by 73 times in the flowering phase with maximum nutrient consumption.

Key words**:** *dry substance, phenological phases, harvest, mineral fertilizers*

INTRODUCTION

Green plants consist from 75-96% of water and 4-25% of organic dry matter that consisting of 70 chemical elements [1]. Water is the basic component of all living organisms, being the medium of chemical, biological and physical reactions. It fulfills the role of transporting nutrients and synthesized substances, regulates the temperature of vegetal tissues in the plant body and osmotic pressure at the cellular level. Concurrently, it serves the enzyme reaction medium [2].

Dry matter accumulation is one of the best estimates for crop reaction to the effect of fertilizes or environmental factors [7].

The dry matter in the winter wheat consists of 9-26% protein in grains decomposing in albumins, globulins, prolamins and glutelines, essential aminoacids in the protein complex, wet gluten in the amount of 16-52% and crude gluten - 5-20% in the form of lipoproteids, nitrogen-free substances, vitamins, etc. [4].

The formation and accumulation of dry matter during the cycle of vegetation is the result of all physiological and biochemical processes taking place in the plant under concrete pedoclimatic conditions. In the literature we find a large amount of experimental material indicating the accumulation of dry matter in the process of growth, development and maturity of winter wheat grains [3, 10].

The process of dry matter accumulation takes place in the in the twining and straw beginning phases very slowly. At the milk phases, sometimes wax phases, an increase in growth intensity of grains development with maximum accumulation of dry matter are observed. At the full maturity of plants, the amount of dry matter is reduced.

The intensity and continuity of the green vegetation biomass accumulation is dependent on the environment conditions and the soil nutritional regime. Ensuring plants during active vegetation with nutrients of ternary or binary nutrients in the soil contributes to the development of foliar system of plants [4, 5].

As a result, the intensity of the photosynthetic process increases, resulting in the increase of

the dry matter in the wheat plants and the harvest quality improvement [6].

MATERIALS AND METHODS

A field study was conducted for two years at the at the Experimental Station for Pedology and Agrochemistry of the Institute "N. Dimo", in Grigorievca village, Causeni district.
Phenological observations and research was carried out on winter wheat culture on the calcareous (carbonatic) chernozem.
The field experience has been assembled according to the randomized blocking method, consisting of 16 variants, in 4 repetitions, on a single field. The recent 2-year agricultural studies 2015-2016 and 2016-2017 have contributed to determine the accumulation of green vegetable biomass and dry matter in winter wheat. The mass of the dry matter was monitored on six phenological phases of wheat: twinning, straw output, spice, flowering, waxy- milk and full maturity. Samples of wheat plants were harvested manually by the random method and the bundle on 1 m^2 in 4 repetitions for each variant, mixed sample was obtained.
Thus, new data has been obtained on the dry matter accumulation process at different levels of nutrition with mineral fertilizers on the carbonatic chernozem. Laboratory analyzes were performed in the Agro-chemistry Laboratory within 3 hours of plant harvesting. In the samples of plants, the metric measurements were carried out and their division into organs, from which the straw is a mixture of stem leaves, spruces and grains, were researched separately.
The winter wheat plants were comminuted, weighed and dried at t = 105^0C for 6 hours. The data obtained were statistically systematized and displayed in tabular and graphical form.

RESULTS AND DISCUSSIONS

In order to obtain a high level of quality harvest, the main determinants are the climatic conditions and the soil type with the fertilization during the critical periods of the winter wheat nutrition. The increase in harvest quality is also dependent on the organic-mineral fertilization system characteristic for soils with percolative water regime or irrigation. Providing sufficient water to soils contributes to increasing the vegetable mass and decreasing the amount of protein in the case of non-application or insufficiency of fertilizers [8].
In the Republic of Moldova, an average of 250-300 thousand hectares of winter wheat is grown annually. The share of nitrogen and phosphorus comes from mineral fertilizers - about 90%. The most common fertilizers are ammonium nitrate - 65%, amorphous - 37%, less potassium chloride - 11% [1]. These fertilizers were studied in the variants at the experimental station.
The purpose of the research was to determine the mass of dry matter obtained as a result of winter wheat fertilization with the mentioned fertilizers under semiarid conditions in the southern area of the country.
According to the criterion of ensuring crops with temperature and humidity, the southern area of Moldova is characterized as the warm pedoclimatic area. The southern area occupies the Prenestrian Steppe and the Tighecian Heights with the formation of ordinary and carbonatic chernozems at altitudes 50-300 m above sea level.
The thermal regime of multiannual temperatures is 9.5-10.0^0C, the sum of the active temperatures ≥100C make up 3,100-3,350^{0}C. The sum of the multi-annual rainfall is 450-550 mm, and the total evaporation - 850-900 mm, and the drought frequency - 3-4 dry years from 10 years [11].
The agrometeorological conditions of the agricultural year 2015 - 2016 influenced favorably the growth and development of the winter wheat manifested by obtaining a high level of harvest. During the agricultural year, rainfall amounted 434 mm, 65 mm more than the multiannual average. Precipitation has fallen irregular during both inactive vegetative and active vegetation periods.
The precipitation during the rest of the year was 262 mm, 46 mm more than the multiannual average, and in the active period -

172 mm, representing a deviation from an average of 108% over the multiannual average. The annual thermal regime - 11.7^{0}C, with 1.9^{0}C more than the multiannual average. Air humidity was relatively high - 70%.

In the agricultural year 2016-2017, the total amount of precipitation exceeded the previous years by 94 - 102 mm or 143% of the norm, with a multi-annual average deviation of 130%. The annual thermal regime maintained relative to 9.2^{0}C, with -1.5^{0}C less than the multiannual average. The relative humidity of the air was 68% annually.

The agricultural year 2015-2016 was wet and 2016-2017 - very wet according to the annual rainfall recorded at the experimental station.

Fertilization of winter wheat with mineral fertilizers indicates an accumulation of organic mass in the twinning phase. In the 2016 at the control consists 4.1 g per 100 dried plants, on the fertilized variants increased to 7.2-9.3 g/100 plants. In the 2017 year, on the control variant the dry matter consist 4.0 g/100 plants and 6.3-6.7 g on the fertilized variants (Figure 1).

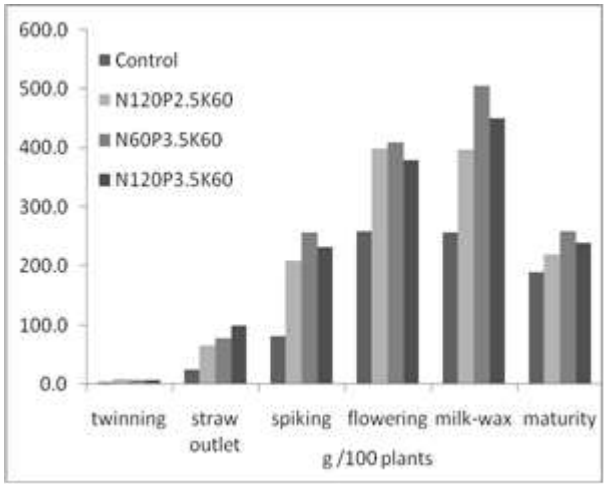

Fig. 1. The mineral fertilizers action on the dry organic mass of winter wheat, 2015-2016.
Source: Own determination.

In the beginning of straw phase the intensive growth and development of winter wheat on fertilizer variants were accumulated on average for 2 years - 2.6-4.3 times more organic mass than at the control variants. At the other development phases of winter wheat plants the difference in the accumulation of biomass quantity was maintained.

During the period with the maximum accumulation, the quantity of dry matter in plants on the control variant was 258.3-397.6 g/100 plants and on the variants $N_{60\text{-}120}$ $P_{3.5}K_{60}$ - 408.5-608.6 g/100 plants: 1.5 times more than control variant, 2016-2017 (Figure 2).

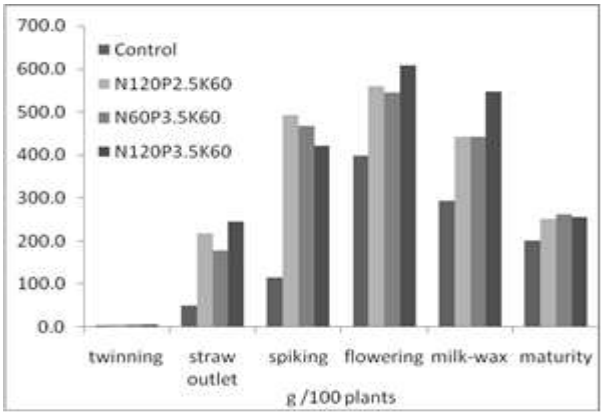

Fig. 2. The mineral fertilizers action on the dry organic mass of winter wheat, 2016-2017.
Source: Own determination.

Recent studies show that the accumulation of dry matter in winter wheat on the control and fertilized variants is analogous to the difference. Mineral fertilizers contribute to increasing the formation and growth of organic matter in plants at the same time [9].

The dynamics of dry matter accumulation in plant organs differ, being closely related to their biology and physiology (Figure 3, 4).

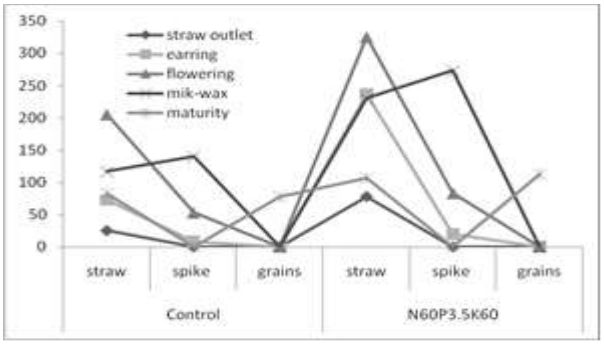

Fig. 3. Dry matter accumulation in the wheat, 2016.
Source: Own determination.

Correlative law in the action of mineral fertilizers on plant organs remains the same. Application of fertilizer in doses of $N_{60}P_{3.5}K_{60}$ has led to an increase in dry matter from 50.5 g to 178.5 g/100 plants in the vegetation

period - increased 3.5 times. And when doubling the dose of 120 kg N/ha on the same background, straw weight increased 4.8 times as compared to the control variant.

In the maturity phase of the wheat grains, the total weight of the plants has decreased considerably. The part of the vegetative organs decreased due to the loss of organic bonds to the grains from total dry matter.

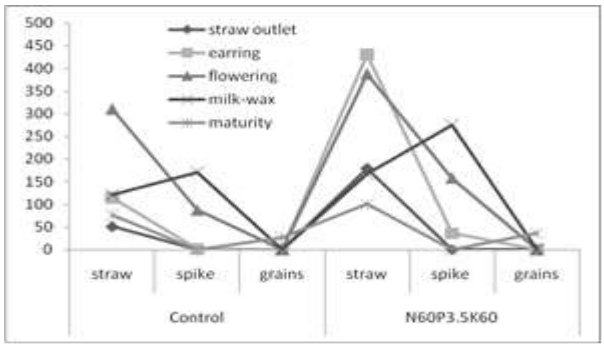

Fig. 4. Dry matter accumulation in the wheat, 2017. Source: Own determination.

The increase of dry matter mass in the grains is rectilinear, which initially rises very suddenly then insignificantly decreased. At the flowering stage the dry mass accumulates on average was 84-100% of the total mass.

The dry matter mass in the winter wheat grains, from the straw beginning to the flowering phase increases by 2.3-5.2 times. The obtained research data shows that the synthesis process of organic mass during the vegetation period was uneven. From seeding to twining period the wheat plants was developed very poorly.

Table 1. Accumulation of dry matter in winter wheat, % of total, 2016 and 2017

Variant	Twin-ning	Straw out-let	Spi-king	Flower-ing	Waxy-milk	Matu-rity
2016						
Control	1.6	9.8	31.4	100	99.1	73.4
$N_{120}P_{2.5}K_{60}$	2.3	16.6	52.5	100	99.3	54.9
$N_{60}P_{3.5}K_{60}$	1.4	15.5	50.9	81.1	100	51.3
$N_{120}P_{3.5}K_{60}$	1.6	22.0	51.4	84.2	100	53.1
2017						
Control	1.0	12.7	29.0	100	73.6	50.4
$N_{120}P_{2.5}K_{60}$	1.2	39.1	88.3	100	79.2	45.0
$N_{60}P_{3.5}K_{60}$	1.2	32.7	85.5	100	81.1	47.9
$N_{120}P_{3.5}K_{60}$	1.0	40.4	69.1	100	90.0	41.9

Source: Own calculation.

During the twinning phase of plants at different fertilized variants, 1-2% of the dry matter was accumulated (Table 1).

After the twinning phase, when the foliar plant surface was increased, the photo-synthesis process intensified, and the organic mass began to increase. From the straw beginning stage in different variants, the plants synthesized about 22-52% in the year 2016 and 40-88% of organic matter in 2017.

From spiking to flowering phase, the mass of the dry matter continues to grow more intensely with a total maximum in 2017. It should be noted that according to the accumulation of dry matter mass, during the vegetation period the unfertilized plants were very small compared to the fertilized variants with mineral fertilizers.

In particular, in 2017, when the straw step was intensive, the quantity of dry matter in the variant $N_{120}P_{3.5}K_{60}$ was 40%, and in the control variant - 13%, with the maximum accumulation in the flowering phase of plants.

Although the synthesis of organic mass is related to plant genetics [6], winter wheat records indicate an increase in different levels. The increase of biomass in the ontogenetic stages of root nutrition indicates that with the increase of the fertilizers doses the synthesis of the organic matter takes place faster. That is why mineral fertilizers have influenced the beginning of plant development.

Percentage systematized data allows us to notice that dependence on water supplies in the soil at a 15-25% deficiency below the norm established with the increase in nitrogen doses of 60-120 kg of N/ha on the optimal background of mobile phosphorus - 3.5 mg P_2O_5/100 g of soil, the process of organic mass synthesis continues to the wax-milk phase by accumulating dry matter in grains averaging 16-19%.

Ensuring the soil with sufficient reserves of useful water contributes to a significant increase in the mass of the dry matter. In this way the biomass accumulation process is very dynamic and depends on the plant's genetic potential, ontogenetic changes and growth conditions. The intensive accumulation of dry matter in fertilized plants with mineral

fertilizers is determined by their degree of nutrient assurance.

CONCLUSIONS

Research on the accumulation of dry matter reveals the action of mineral fertilizers on six phenological phases. The data presented show that the period from earring phases to flowering, together with increasing nitrogen and phosphorus doses, accumulates 4-5 times more dry matter, than control variant.
Dynamics of dry matter accumulation indicate a sharp increase of 2-5 times the application of 60-120 kg N/ha on $P_{3.5}K_{60}$ background.
At the milk-wax phase and full maturity phase, organic mass losses occur, the accumulation of dry matter over 80% occurs in the wheat grains.

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DIRECTIONS OF THE ORGANIZATIONAL AND INVESTMENT MECHANISM OF AGRICULTURAL LANDSCAPES USE

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Abstract

The statistical data on investments in Rivne region for 2010-2016 are analyzed and presented in terms of sources of financing: the state budget, local budgets, own funds of enterprises, loans and loans, foreign investments and other sources of financing. Correlation analysis of available data is carried out. It was found that the profit of private peasant farms has a high linear dependence on budget investments, own funds of enterprises, loans, as well as other sources of financing. Farmers, however, depended heavily on state budget funds, but more dependent on foreign funds than OSG. Research shows that the greatest problem of low productivity of agricultural land use has low ecological security. The structural and economic system of land resources use is discussed. Directions for effective functioning and economic stimulation of balanced use of agricultural lands are offered.

Key words**:** *land resources, agrarian sector, economic mechanism, ecological management, investments, farms, personal peasant farms*

INTRODUCTION

Taking into account the situation in agriculture and in particular in the economy in general, improvement of the economic structure of agrarian land should be deliberated over: advancement of efficient principles for the economic mechanism of balanced use of agrarian land; development of directions of how to increase the efficient use of agricultural lands. Regarding land investment, first of all, it is essential to determine their essence and features in comparison with other types of investments. Investments represent an investment of capital for the purpose of its subsequent increase in the broadest sense, as is known. However, in different spheres of activity, they have their own peculiarities [3].

The objective of the paper is to determine the directions on the effective use of organizational-investment mechanism of agricultural land on an example of Rivne region.

MATERIALS AND METHODS

The need determines the need to find a balance between the ecological and economic efficiency of the use of agricultural land in the Rivne region for the period from 2010-2016, according to statistical data, a linear regressive multivariate predictive model with organic production is constructed.

The economic-statistical methods used for processing the data in the assessment of the ecological and economic condition of agricultural lands have been: correlation-regression analysis for the study of the impact of agricultural activity on the state of agricultural land use, mathematical modeling of the establishment of optimal production and industry structure of farms.

Theoretical factors of the agricultural land use, the realignment of land relations and the

accomplishment of rational land use are presented in the works of domestic scientists, in particular O.I. Drebot [11], D.S. Dobrika [10], O.D. Gnatkovych [3], Research on land use organization and improvement of the economic mechanism of balanced use of land resources in agriculture are presented in the scientific works of domestic scientists, in particular N.I. Palyanychko [12].

Intensification of land use involves intensive soil use, which will increase the economic efficiency of using agricultural lands. At the same time, there is an increase in negative anthropogenic influences, including an increase in physical pressure on the soil and the chemistry of agricultural production. This leads to a deterioration of the environmental situation, a decrease in the environmental performance of land use.

But there is a need for further study of the formulation of a practical basis for advancement of the organizational and economic system for the agricultural land use.

RESULTS AND DISCUSSIONS

At present, the agrarian sector of the economy is known to be in decline, thus, so as to increase the productivity of farms and private peasant farms, it is essential to attract financial resources for their independent development, that is, the implementation of production activities of farms at the cost of investments. Given that the successful development of farms depends on the rational and efficient use of land resources by land users and landowners, investments must first of all be used for the acquisition, attraction and reproduction of the infrastructure of the resource base of Ukraine and in particular of the region. One of the directions of increase of investments in agricultural land in Ukraine, in particular in the studied region, which will provide the highest level of interest of potential investors. We note that for today the improved result needs to be improved to the state of their use, as this is due to the underestimation of elements such as low funding, lack of interested landowners, land users, etc.

The analyzed statistics on investments in Rivne region for 2010-2016 is shown in (Table 1). The data is presented in terms of sources of funding: the state budget, local budgets, own funds of enterprises, loans and loans, foreign investments and other sources of financing in Ukrainean currency (UAH).

Table 1. Investments in agriculture (thousand UAH)

	Total investments	**Source of investment**					
		State budget	Local budgets	Own funds of enterprises and organizations	Bank loans and other loans	Funds of foreign investors	Other sources of funding
2010	174,154	6,909.0	20,488.6	90,293.3	33,353.8	10,720.8	12,388.5
2011	337,900	22,862.0	42,523.0	223,133.0	19,204.0	12,803.0	17,375.0
2012	214,050	17,987.3	19,486.3	147,196.9	17,987.4	1,199.2	10,192.9
2013	288,190	12,351.0	30,054.0	208,731.9	13,997.9	1,235.1	21,820.1
2014	315,900	3,948.8	32,467.5	235,170.0	15,356.3	5,703.8	23,253.8
2015	325,678	4,145.7	37,543.6	254,430.2	15,758.6	5,906.9	25,343.5
2016	346,521	4,235.5	39,756.7	273,423.5	15,965.7	6,208.8	28,356.8

Source: [7; 8].

Over the past few years, profit from various forms of management, for example: total investments have increased, in parallel with 2016, to UAH 172,367 thousand, which is related to revenues to the state budget decreased in 2016 and amounted to 2,673.5 thousand UAH, local revenues the budget also increased by 165,119.9 thousand UAH.

The results are positive from the sale of agricultural crop production, as we can see that the return on investment in the Rivne region has a positive shade.

In Table 2, there are presented data on the profit of different forms of farms obtained from the sale of crop production for the years 2010-2016.

In 2016, the profit from crop sales accounted for 2,864,322 UAH, being three times higher than in 2010.

The highest share in the total profit belongs to personal peasant farms which in 2016 was 89.9 % compared to 84.5 % in 2010.

Table 2. Farms' gain from the sale of crop production (thousand UAH)

	Total profit	Personal peasant farms	Farms
2010	934,237.6	790,012.5	144,225.1
2011	1,112,694	947,072.2	165,622.2
2012	1,359,086	1,082,505	276,580.6
2013	1,536,468	1,212,452	324,016.5
2014	2,341,511	1,970,696	370,815.1
2015	2,565,743	2,340,543	390,567.2
2016	2,864,322	2,576,743	420,975.3

Source: [7]

Correlation analysis of available data is carried out. It was found that the profit of private peasant farms has a high linear dependence on budget investments, own funds of enterprises, loans, as well as other sources of financing. Farmers, however, depended heavily on state budget funds, but more dependent on foreign funds than private peasant farms (OSG).

Earnings and OSG and farms have a high level of linear dependence on the use of mineral fertilizers, and OSG - also organic.

For farms, a stronger logarithmic relationship between profit and year; for OSG stronger linear. The outcome of the correlation analysis is presented in Table 3.

Table 3. Coefficients of correlation linear dependence farm returns from investments and fertilizers

Correlation of profit with magnitude	Personal peasant farms	Farms
Year	0.906317	0.980639
Investments from the state budget	-0.531353	-0.38868
Investments from local budgets	0.223015	0.000854
Own funds of enterprises and organizations	0.650037	0.571784
Loans and other loans	-0.611323	-0.7857
Investments of foreign investors	-0.345685	-0.76025
Other sources of funding	0.715122	0.616773
The rate of organic fertilizer application	0.609123	0.44268
The rate of mineral fertilizer application	0.624278	0.750878

Source: author's results.

According to official statistical data, a nonlinear forecasting model for estimating farm returns from different types of investments and type of management has been constructed, and a regression analysis has been carried out. This prognostic model made it possible to estimate future profits from OSG and farms for the classical scheme of use of fertilizers and the transition to organic production.

Multifactor predictive nonlinear regression model (profit of OSG and farmers from investments)

For the profit model of OSG, regression dependence has the form:

$$y = a_0 + a_1 Yr + a_2 Ln(Db) + a_3 Ln(Lb) + a_4 Pb + a_4 Ln(Cr) + a_5 For + a_6 Oth + a_7 Ln(Org) + a_8 Min \quad (1)$$

For a profit model for farms is:

$$y = a_0 + a_1 Ln(Yr) + a_2 Db + a_3 Ln(Lb) + a_4 Ln(Pb) + a_4 Ln(Cr) + a_5 For + a_6 Oth + a_7 Ln(Org) + a_8 Ln(Min) \quad (2)$$

where:

a_0-a_8 - regression coefficients,

Yr - year

Db - public investment

Lb - investment in funds local budgets

Pb - own funds

Cr-loans

For - a profit model for farms:

For - foreign investment

Oth - other means

Org - Norms of Organic Fertilizer

Min - Mineral fertilizer application rates

y - profit.

The obtained model was used to predict the profit of OSG and farms by 2023 in the event of a transition to a model of organic production, as well as a partial replacement of organic fertilizers by animal waste. The outcome of the calculations is presented in Table 4. It is found that in the case of transition to an organic model of enterprise, enterprises should increase the prices for

products by approximately three times to maintain the existing level of profitability.

The urgent thought should be given to efficiency of the land structure in the Rivne region, taking into consideration the consequences of the development of new forms of proprietorship and management, on the one hand, and environmental requirements caused by the threatening state of the land fund of the region, on the other.

Table 4. Forecast of the profit of OSG and farms with partial and complete transition to organic production

	OSG	Farms	OSG	Farms	OSG	Farms
2017	3,266,700	121,792	1,011,719	116,537	2,270,022	134,624
2018	3,409,794	103,885	1,055,498	99 ,163	2,351,535	117,442
2019	3,536,537	85,477	1,108,091	81 ,772	2,441,316	100,230
2020	3,392,020	61,612	1,174,928	64 ,365	2,544,946	82,988
2022	3,616,663	44,246	1,268,340	46 ,938	2,674,784	65,717
2023	3,907,809	26,853	1,428,150	29,486	2 ,870 ,724	48,413

Source: calculated by the author

This problem has a high level of practical significance, especially taking into account the wide variety of natural and economic conditions that complicates the implementation of unified solutions and approaches. Since scientific and practical research should be accompanied by the development of multidirectional projects for the restoration of degraded, low productive land, the problem of protection and rational use of agrarian land must be regarded as a combination of managerial, economic and environmental measures. Since the condition is the basis for building an organizational and economic mechanism. Nothing but this complex of measures makes it possible to combine environmental requirements with the land quality and the economic potency of its usage, and the isolation of the organizational component is aimed at the harmonious combination of these components. That is, because of the introduction of a set of incentive measures aimed at soil protection, increasing their fertility, the way to increase the agricultural production output as well as enhancement of its quality, ensuring the boost of the managerial efficiency of enterprises opens.

According to O.D. Hnatkovych, investments in agricultural enterprises are a socio-economic category that expresses the relationship between legal entities, individuals and the government in the process of investing assets in the expansion of land tenure of enterprises and improving the fertility of existing land for entities with a view to obtaining at some time profits by agricultural enterprises by mobilizing their capital, rationalizing the structure and perfecting the economic efficiency of land use [3].

It should be noted separately that investments from the EU countries are very important for Ukrainian economy sectors, especially for agriculture. EU enlargement to the East should have a positive impact on the flows of direct European investment in Ukraine. According to scientists, the rapprochement with the EU and the development of economic cooperation with this bloc historically contributed to the internationalization of the bordering states' economies and the extension of their specialization in the international division of labor [3, 4].

Research shows that the greatest problem of low output of agrarian land use has low environmental stability. The level of investment into land use is understood to be important in generation of the profit of crop farming in the Rivne region. Most landowners and land users are trying to rebuild their business activities by following all the requirements of use. Nowadays, the issue on the proper use of lands under farming and land conservations is almost devoid of both ecologically and economically, the solution of this question requires funding and investment in such a way that the owner who received income from the receipt of organic gross crop production could correctly do everything calculate. Quite often we see that tenants who

deliberately violate the environmental legal standards on land use.

Currently, due to reforms in agriculture, the relations between investors and farmers have significantly changed. Active development should receive all forms of investment. Together with other economic instruments, the investment, in the opinion of the author, is intended to take a key position in stimulating production and strengthening the economy of the country and the region.

The modern system of investing is no longer marked by the kind of policy that was customary for the time of restructuring. It is more liberal: the investor himself chooses those investment-attractive objects, which services they would like to use. The rights and obligations of the investment borrower are stipulated in the investment agreement by mutual consent. Such a system, in the opinion of the author, will create conditions for inter-farm competition. However, studies have shown that investment involvement in the sphere of agriculture does not fully meet the requirements of a market economy:

-the imperfectly worked out mechanism of investment (in all rural areas occupy commercial banks that provide preferential lending and investment in rural areas at their own cost and resources);

- there is no support for agriculture from the state, which ensures the effective functioning of agricultural production;

- loss-making activity of farmers and private farms, which prevents the return of received investments. Such a system requires the correction or reform of the overall course of reforms and, in particular, changes in the agricultural investment system. A balanced level of utilization of land resources, including in agriculture, can be achieved on the basis of a system of economic measures [1; 6]. Since balanced agricultural development implies not only the productive use of the agro ecosystem, but also the return to it of the functions of the natural ecosystem, that is, the ability to self-reproduce. [2; 5; 9].

In our opinion, an all-embracing attitude to the issues of the investment resources establishment and the enhancement of the investment process as a set of norms and rules of investment of farms and private peasant farms is required. Investment services for agriculture at the moment must include several stages, including the programming, presentation, use and return of investment funds in the future.

At the same time, high efficiency of land use will contribute to increasing the volume of environmentally safe products and growing of high-quality products and expanding agricultural exports, preserving biodiversity in the country.

The ecological component of investment projects is necessary to ensure the balance of land resources and consistency with economic and environmental indicators to obtain an effective result. Since the state and investors should be stakeholders.

Foreign investment can be the basis not only for a return to high growth rates of production, a significant acceleration of innovation recovery of the Ukrainian economy and agriculture in particular. It should be noted that with the transition to a balanced land use, there is improvement in ecology the integral part of investment activity.

It is possible to program investment investments based on investment directions of farms. The economy or enterprises that have a stable position in commodity markets, these areas should be an integral part of their programs of financial and social development in the future. As regards ensuring the circulation of capital and increasing commercial operations driven by the program for market participants, they are enhanced by investment resources.

In order to trigger the rational usage of agrarian land, an organizational and economic mechanism has been developed, in the structure of which there are four systems: security system, functional system, target system (Fig.1).

The normative-legal, institutional, informational, implementing and effective block of organizational-economic mechanism, which forms the subsystem of external and

internal support of agricultural lands use, is proposed.

The institutional unit of functioning derives from the instrumental basis of agricultural land use, which is the main scientific problem that causes the objective need to create an effective institutional structure of regulation of the legal framework of land resources.

The institutional block depends on the state of land resources use and development at the regional level regarding the protection and improvement of their soil fertility.

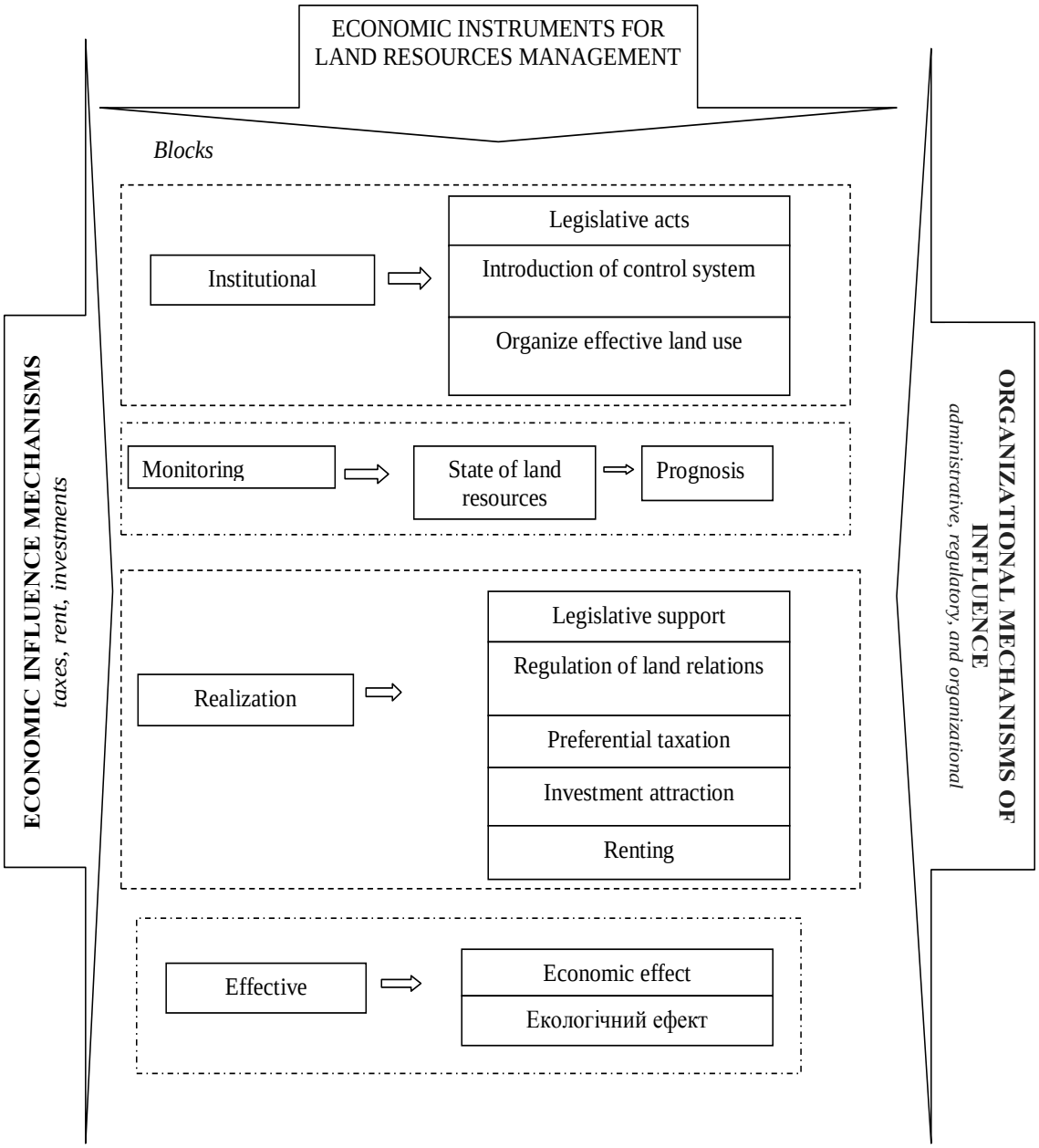

Fig.1. Organizational and economic mechanism of land use
Source: author's development.

Ensuring balanced production development should be achieved through economic activity between harmonization of equilibrium and the reproductive potential of the land.

A significant factor of the negative changes in the state of land resources is the imperfection of the management system, the insufficient amount of organic and mineral fertilizers; significantly plowed land; application of

heavy machinery; reducing the area of reclaimed land while simultaneously increasing the area of disturbed lands.

The implementation block offers instruments for preferential taxation of the organizational and economic mechanism for the utilization of land resources, may be implemented by enterprises that produce environmentally friendly products, we are offered tax benefits of 5-8 years in agricultural enterprises and farms that contribute to the financial situation.

It is proposed to attract investments in the sphere of land tenure as they should consist in the development of investment projects at the regional and local levels. Foresighting of widely varying mineral fertilizers for the use of organic fertilizers.

An assessment of the effectiveness of the organizational and economic mechanism for using land resources can be achieved through a productive block that shows economic and environmental impacts. In particular, ensuring the rational use of lands under farming and effective use of the economic mechanism and reproduction of soil fertility. We are invited to use the economic mechanism with the help of levers and tools. Using the mechanism of economic stimulation of the elements of the functional block (organization, stimulation) will ensure the receipt of positive results in the future (the result block).

At this stage of development of land relations, introduction of new approaches to ensuring ecological and economic directions of economic use, reproduction and preservation of land resources of the region is anticipated. Analysis of the major indicators of land use by economic entities shows that reforms in the agricultural sector have practically not yielded positive production results and did not solve the problem of ensuring rational ecologically safe and efficient use and comprehensive protection of land resources.

CONCLUSIONS

The following directions should be noted for the effective functioning and economic stimulation of rational use of the land under farming:

-to introduce a comprehensive system of state standards, norms and rules in the field of use, protection and restoration of land resources;

-differentiation and classification to implement measures to protect land and environmental, land stabilization at different hierarchical levels (national, regional, local) and types of funding;

-to develop regional schemes for the formation of ecological networks for the preservation of landscape biodiversity;

-to preserve degraded, unproductive and techno-contaminated lands;

-to stop the extraction of especially valuable lands, in particular, agricultural purposes for non-agricultural needs.

More attention needs to be paid to the use of land, given that organizational measures need less effort to implement. The basis should be the principle - land use should be profitable, provided the components of the environment state are taken into account in determining the factors of economic efficiency. Thus it will be possible to avoid useless unproductive costs and to prevent the risk of harm to the land, the more so that often the deterioration of land is irreversible.

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ECONOMIC ANALYSIS OF GREENHOUSE STRAWBERRY PRODUCTION: A CASE STUDY OF AYDIN PROVINCE, TURKEY

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Abstract

The purpose of the study was to carry out an economic analysis of strawberry production in the Aydın province of Turkey which has a significant potential for strawberry production. The main material of the study was comprised of data acquired via survey method from 59 greenhouse strawberry producers in the Sultanhisar and Köşk districts of the Aydın province. The producers were classified according to their size as Group I (1-10 decares; 17 farms), Group II (11-25 decares; 20 farms), Group III (26-50 decares; 14 farms) and Group IV (>50 decares; 8 farms). Average strawberry land presence in establishments was 27.19 da and the share of strawberry lands in total land presence was calculated as 52.64 %. The ratio of producers using certified seedling was observed to be highest in Group IV (100 %) and lowest in Group I (47.06 %). The strawberry varieties produced most frequently were determined as Rubygem, Fortuna and Festival. Establishment costs per decare according to the total producer average was calculated as 4955.07 TL. Seedling costs (42.86 %) were determined to have the highest share among the establishment costs. Production costs according to all farm groups average was determined as 3101.56 TL/da. It was determined that labor cost is ranked number one among the total production costs (29.91 %). It was determined that the gross, net and relative return per decare according to farm groups increases with increasing farm size. It was observed that larger farms are more advantageous with regard to economic criteria.

Key words: *greenhouse strawberry, production cost, profitability*

INTRODUCTION

Strawberry (*Fragaria vesca*) is a fruit included in the berry fruits group with a beautiful appearance, color, nice odor and taste the production of which is increasing due to the newly developed methods of production and its newly developed cultivars [1]. In addition to its consumption as a fresh fruit, strawberry is also used for making jams, jellies, ice cream, fruit yoghurt, fruit juice, liquor, wine with its dried form used in making cakes and grain flakes. It can be stated that strawberry is an important fruit with a wide production area in the world due to the fact that it can adapt to the preferences of both the consumers and the food industry [2]. Turkey is ranked number five in the world with a strawberry production of 400,167 tons after China (3,724,647 tons), USA (1,449,280 tons), Mexico (658,436 tons) and Egypt (407,240 tons) [8].

Strawberry production in the modern sense started during the 1970's in Turkey [10]. While strawberry was produced only in Istanbul, Bursa and Karadeniz Ereğlisi regions until recently, its production has been gaining popularity [6]. Mersin province is the leading province with regard to strawberry production in Turkey. The Mersin province meets 35 % of the total strawberry production in Turkey. The Aydın province where the present study has been carried out in is ranked number two after Mersin. Aydın province makes up about 15 % of the total strawberry production in Turkey with 63,843 tons [14].

The purpose of this study was to carry out the economic analysis of greenhouse strawberry production in Aydın province which has an important potential in Turkey with regard to strawberry production. For this purpose, general features of greenhouse strawberry producers such as population, age, education level, experience, production pattern, average

producer land size as well as success criteria such as cost items for strawberry establishments and production, gross product value, gross profit, net profit and relative return have been determined after which these criteria were compared according to farm groups for determining which of the farm groups are more advantageous. Studies carried out in Turkey are focused more on the technical aspect of strawberry production. The number of studies evaluating the economical aspect of strawberry production is limited. It is expected that the findings acquired from the study shall be beneficial for all strawberry producers, researchers and related institutions.

MATERIALS AND METHODS

The main material of the study was comprised of original data acquired via survey method from greenhouse strawberry production farms at the Sultanhisar and Köşk districts of Aydın province. Similar studies made by various related individuals and institutions as well as reports and statistics were also used. The survey data covers the 2015 production period.

Ten villages from the Sultanhisar and Köşk districts where strawberry production is carried out intensely were selected as the study area based on the information obtained from records on strawberry production prepared by technical staff of Aydın Provincial Directorate of Food, Livestock and Agriculture. All agricultural farms in these districts and villages that operate in line with the purpose of the study comprised the population of the study. The districts selected as the study area make up about 77% of the Aydın province with regard to strawberry production [14]. Hence, it can be stated that the study region represents the strawberry producer agricultural farms in the Aydın province.

Neyman Method from among the layered sampling methods was used for determining the number of samples to be included in the survey [15]. The number of samples was calculated via equation 1.

$$n = \frac{(\sum Nh\ Sh)^2}{N^2\ D^2 + \sum Nh\ Sh^2} = \frac{(2{,}088.98)^2}{507^2 * 0.488^2 + 12{,}975.80} = 59 \quad (1)$$

where:
n: Sample size
N: Total number of units in the population
Nh: Number of units in group h
Sh: Standard deviation of group h
Sh^2: Variance of group h
D^2: d^2 / z^2
d^2: Allowed error from population average (19.16 da) (5 % deviation from the average)
z^2: Value of the allowed safety limit (%95) in the distribution table (1.96).

The number of samples for representing the main population was calculated via Equation 1 as 59. The farms to be subject to the survey were selected randomly. Since the land presence of the farms differs, it was decided to classify the farms into groups in order to ensure that the population is homogeneous. Accordingly, the farms were classified as Group I (1-10 decares; 17 farms), Group II (11-25 decares; 20 farms), Group III (26-50 decares; 14 farms) and Group IV (>50 decares; 8 farms). The data acquired via surveys from the determined farms were uploaded to the computer and evaluated by way of calculations and tables in Microsoft Excel and SPSS software.

Foreign labor fees In the study area were taken into as basis for calculating family labor fees. General administrative costs were calculated as 3% of the total variable costs. Revolving fund interest was calculated by multiplying the variable costs with half of the interest rate applied by T.C. Ziraat bank on plant production credits (4%). The interest for bare land value was calculated as 5% of the bare land value in the study region. Establishment costs yearly depreciation share was calculated by dividing the total establishment costs during the production period to the economic life of the establishment (4 years). A 5% interest was applied on the total establishment costs half value [11]. Gross product value was calculated by multiplying the amount of products obtained as a result of strawberry production activities with the sales price. Gross profit was calculated by subtracting the variable costs from gross product value while net profit was calculated by subtracting the

production costs from gross product value. Gross product value was divided by production costs for determining relative return [13].

RESULTS AND DISCUSSIONS

Table 1 presents the data on the age, education level, population, membership in cooperative, strawberry cultivation training and involvement in farmer registration system. It was determined that the age averages of the producers vary between 41.5-48.14 years according to the farm groups, that the duration of education they received varies between 6.57-8.50, that their agricultural experience varies between 17.88-24.75 years and that their level of experience in strawberry cultivation varies between 12.50-17.30 years. Based on the acquired data, it was observed that the population of the families of the producers varies between 3.06-4.14 people according to the farm groups with an average of 3.46 people. It was also put forth that the membership in cooperative ratios for the producers range between 11.76 % and 50 %, that the ratios of producers trained in strawberry cultivation varies between 21.43 % and 41.18 % and that the ratio of producers involved in the farmer registration system varies between 58.82 % and 87.50 %.

Land presence of farms is provided in Table 2. Accordingly, it was determined that the total land size varies between 22.85 da and 105.88 da according to farm groups with an average of 51.65 da. Strawberry land size was observed to vary between 5.91 da and 89 da with an average value of 27.19 da. The share of strawberry land size in total land size was calculated as 52.64 %. The shares of property land and rent land in total land size were determined as 45.73 % and 54.27 % respectively.

Product pattern in farms is presented in Table 3. The share of strawberry cultivation area in total land presence of farms was determined to vary between 25.87 % and 84.06 % with an average value of 52.63 %. It can be observed that the share of average strawberry cultivation area and strawberry cultivation area in total land presence of the farm increases with increasing sizes of the farm groups. While strawberry is ranked number one with a share of 52.64 % in total land presence according to farm averages, it was followed respectively by olive (17.60 %), corn (14.54 %), and fig (3.90 %).

Certified seedling use of strawberry farms and their supply places are given in Table 4. The ratio of certified seedling user producers varies between 47.06 % and 100 % according to the farm groups. It was determined that Group IV has the highest ratio of certified seedling use (100%) while Group I has the lowest ratio (47.06 %). It was determined that the farms supply the highest number of seedlings mostly from firms (64.41 %) and the lowest number from cooperatives (6.78 %). The ratio of farms supplying seedlings from firms was highest in Group IV (87.50 %) and lowest in Group I (47.06 %).

Table 5 presents the different strawberry varieties produced in farms and the ratios of the farm groups that produce these varieties. It was determined based on the farm groups' average that Rubygem variety is the most frequently cultivated strawberry variety followed by Fortuna and Festival varieties. The ratios of farms cultivating Rubygem, Fortuna and Festival varieties were determined respectively as 83.5 %, 44.07 % and 33.90 %. It was observed that the highest ratio of Rubygem variety is in Group IV (100%) while the lowest ratio is in Group I (65.71 %) farms. While the Fortuna variety ranked number two according to its cultivation percentage in farm groups was observed to be cultivated at most in Group IV (62.50 %) and lowest in Group I (17.65 %) farms.

Strawberry production is comprised of establishment and production periods.

However, different from other perennial crops, strawberry starts to produce yield during its first establishment year. Establishment and production costs are calculated separately when calculating the strawberry cost.

Table 1. Producers' features

Features	Farm groups (da)				Average
	I	II	III	IV	
Age (year)	46.06	47.10	48.14	41.50	46.29
Education level (year)	7.94	7.65	6.57	8.50	7.59
Agricultural experience (year)	21.35	24.75	22.00	17.88	22.19
Experience in strawberry production (year)	13.76	17.30	17.29	12.50	15.63
Population (person / family)	3.06	3.25	4.14	3.63	3.46
Membership of cooperative (%)	11.76	50.00	50.00	25.00	35.59
Strawberry cultivation training (%)	41.18	30.00	21.43	37.50	32.20
Involvement in farmer registration system (%)	58.82	70.00	64.29	87.50	67.80

Source: Own calculation.

Table 2. Land presence of farms

Land presence (da)	Farm groups (da)				Average
	I	II	III	IV	
Total land size	22.85	53.76	52.63	105.88	51.65
Strawberry land size	5.91	15.86	33.88	89.00	27.19
Property land	19.74	20.725	38.49	13.13	23.62
Rent land	3.12	33.03	14.14	92.75	28.03

Source: Own calculation.

Table 3. Grown products in farms (da/farm, %)

Products	Farm groups (da)								Average	
	I		II		III		IV			
	da	%	da	%	da	%	Da	%	da	%
Strawberry	5.91	25.87	15.86	29.49	33.88	64.38	89	84.06	27.19	52.63
Vegetable	0.21	0.90	-	-	-	-	-	-	0.06	0.11
Maize	-	-	21.15	39.35	1.43	2.71	-	-	7.51	14.54
Watermelon	0.56	2.45	2.00	3.72	1.29	2.44	5	4.72	1.82	3.53
Mandarin	0.29	1.29	-	-	-	-	-	-	0.08	0.16
Fig	3.82	16.73	0.90	1.67	2.57	4.89	-	-	2.02	3.90
Orange	0.18	0.77	0.15	0.28	2.14	4.07	1.25	1.18	0.78	1.51
Chestnut	0.59	2.57	2.00	3.72	0.36	0.68	-	-	0.93	1.80
Peach	-	-	0.15	0.28	-	-	1.25	1.18	0.22	0.43
Olive	11.29	49.42	5.80	10.79	10.96	20.83	9.375	8.85	9.09	17.60
Alfalfa	-	-	5.75	10.70	-	-	-	-	1.95	3.77
Total	22.85	100.00	53.76	100.00	52.63	100.00	105.875	100.00	51.65	100.00

Source: Own calculation

Table 4. Certified seedling use and supply places of farms (%)

Are strawberry seedlings certified?	Farm groups (da)				Average
	I	II	III	IV	
Yes	47.06	80.00	78.57	100.00	72.88
No	52.94	20.00	21.43	0.00	27.12
Total	100.00	100.00	100.00	0.00	100.00
Seedling supply places					
Firm	47.06	65.00	71.43	87.50	64.41
Dealer or other producers	35.29	10.00	7.14	12.50	16.95
Own production	29.41	10.00	28.57	0.00	18.64
Cooperative	0.00	15.00	7.14	0.00	6.78

Source: Own calculation.

Table 5. Different strawberry varieties and usage rates in farms (%) *

Strawberry varieties	Farm groups (da)				Average
	I	II	III	IV	
Rubygem	65.71	85.00	92.86	100.00	83.05
Festival	17.65	45.00	35.71	37.50	33.90
Portola	-	5.00	-	-	1.69
Fortuna	17.65	55.00	50.00	62.50	44.07
Camarosa	5.88	5.00	-	12.50	5.08
Fresh chilled	5.88	10.00	21.43	12.50	11.86
Sabrina	5.88	-	14.29	50.00	11.86

*percentages are higher than 100 because of multiple choice
Source: Own calculation.

Establishment costs for strawberry production are comprised of seedling costs, fertilizer costs, drip irrigation system costs, planting seedlings cost, costs of nylon used for mulching, iron, rope and wood pile costs. Strawberry establishment costs in farms are

given in Tables 6 and 7. It was observed that there are no significant differences between strawberry establishment costs with regard to farm groups. Establishment cost per farm per decare was observed to be highest in Group III with (5,036.67 TL/da) and lowest in Group I with (4,761.51 TL/da). Establishment costs per decare according to all establishments average was calculated as 4,955.07 TL. It was determined that seedling costs had the highest share among all establishment costs (42.86 %). Seedling costs were followed by nylon (24.18 %) iron (14.21 %) and labor (planting seedlings and greenhouse establishment: 11.72 %). Ağır and Saner (2014) [2] carried out a study in which greenhouse strawberry establishment costs were determined as 4,889.06 TL/da and Balcı (2005) [4] carried out a study in which open-field strawberry production establishment costs were determined as 2,162.75 TL/da.

Cost items for strawberry production were classified as fixed and variable costs after which they were subject to analyses. The variable costs are those that increase or decrease subject to production volume. Whereas fixed costs are those that do not change subject to production volume or in other words they are expenses that are present regardless of whether production is carried out or not [9]. Tables 8 and 9 present the strawberry production costs and the shares of costs in strawberry production. It was determined that the strawberry production costs per decare range between 2,830.06 TL to 3,323.13 TL subject to farm groups. Production costs were observed to be lowest in Group II and highest in Group I. Production cost according to all farm groups' average was determined as 3,101.56 TL/da. The share of variable costs in production costs was calculated as 48.93 % and the share of fixed costs was calculated as 51.07 %. While labor costs were ranked in the first place among total production costs (29.91 %), they were followed by strawberry establishment depreciation share, land rent and machinery rent.

Gross profit is an important criterion for success in determining the competition strength of production activities with regard to the use of current sparse production factors. In other words, gross profit is an important criterion indicating the success of the establishment organization [7]. Table 10 presents the gross profit, net profit and relative return in farms per decare in the study region according to farm size groups. It was determined that gross profit per decare increases proportionally with farm size according to farm groups. Gross profit for farms in Groups I, II, III, and IV were determined respectively as 10,524.35, 10,965.77, 11,791.26 and 12,137.31 TL. Net profit per decare in the studied farms was 8,891.51 TL for Group I farms, 9,686.23 TL for Group II farms, 10,215.40 TL for Group III farms and 10,596.59 TL for Group IV farms. Accordingly, it is observed that net profit per decare increases with increasing farm groups. Relative return is another criterion for measuring strawberry production success. It was determined that relative return increases with increasing farm size. Relative returns were determined as 3.68, 4.42, 4.48 and 4.68 for Groups I, II, III and IV respectively. It was observed based on these results that profitability increases with increasing farm size. Ağır and Saner (2014) [2] carried out a study in which it was reported that greenhouse strawberry production is more profitable than open-field strawberry production. Lille et al. (2003) [12] carried out a study in Estonia comparing different strawberry varieties with regard to yield and profitability using hay mulch and plastic mulch techniques. It was determined as a result of the study that hay mulching method increases yield and profitability more. Atasay (2007) [3] carried out a study in which yield, quality and vegetative characteristics of certain nutritional applications were examined for conventional and organic production. It was determined that farm fertilizer + green fertilizer + clinoptilolite + sea weed application had the highest value for net profit. Daniel et al. (2008) [5] carried out a study in the Florida State of USA in which greenhouse organic, greenhouse conventional and open-field strawberry production were

compared with regard to profitability. It was determined as a result of the study that greenhouse organic strawberry production is 9.5 times more profitable than open-field conventional strawberry production and that greenhouse conventional production is 1.5 times more profitable than open-field production.

Table 6. Strawberry establishment costs in farms (TL/da)

Cost items	Farm groups (da)				Average	P-value
	I	II	III	IV		
Seedling	1,905.88[a]	2,241.75[b]	2,151.79[ab]	2,155.63[ab]	2,111.95	0.070*
Fertilizer	83.13	98.22	87.07	112.41	93.15	0.872
Drip irrigation system	150.29	153.00	157.21	150.00	152.81	0.137
Planting seedlings	196.18[a]	212.50[ab]	226.61[b]	220.22[b]	212.19	0.001***
Nylon	1,155.14[a]	1,159.39[b]	1,241.62[b]	1,309.20[b]	1,197.99	0.003***
Iron	803.53[a]	678.22[b]	677.85[b]	603.46[c]	704.10	0.000***
Rope	51.18[a]	51.74[a]	52.65[ab]	58.01[b]	52.65	0.005**
Wood pile	57.67	68.65	68.78	40.58	61.71	0.352
Greenhouse establishment labour	358.52	369.14	373.08	380.20	368.52	0.140
Total	4,761.51	5,032.62	5,036.67	5,029.71	4,955.07	0.169

TL: Turkish Lira; 1USD=2.72 TL in 2015 (average); *: p<0.10; **: p<0.05; *** p<0.01
[abc] means with different superscripts on the same row are different.
Source: Own calculation

Table 7. Share of cost items in strawberry establishment (%)

Cost items	Farm groups (da)				Average
	I	II	III	IV	
Seedling	40.03	44.54	42.72	42.86	42.62
Fertilizer	1.75	1.95	1.73	2.23	1.88
Drip irrigation system	3.16	3.04	3.12	2.98	3.08
Planting seedlings	4.12	4.22	4.50	4.38	4.28
Nylon	24.26	23.04	24.65	26.03	24.18
Iron	16.88	13.48	13.46	12.00	14.21
Rope	1.07	1.03	1.05	1.15	1.06
Wood pile	1.21	1.36	1.37	0.81	1.25
Greenhouse establishment labour	7.53	7.34	7.41	7.56	7.44
Total	100.00	100.00	100.00	100.00	100.00

Source: Own calculation.

Table 8. Production costs in farms (TL/da)

Cost items	Farm groups (da)				Average	P-value
	I	II	III	IV		
Temporary labour	714.81[a]	605.26[b]	605.35[b]	585.81[b]	634.21	0.013***
Fertilizer	204.16	173.49	191.72	188.70	188.72	0.968
Pesticide	56.73	38.49	42.57	34.68	44.20	0.467
Irrigation	150.29	153.00	157.21	150.00	152.81	0.245
Machinery rent	499.27	520.64	312.32	330.91	439.33	0.201
Revolving fund interest	65.01	59.64	52.37	51.60	58.37	0.497
Total variable costs(A)	1,690.29[a]	1,550.52[b]	1,361.54[b]	1,341.70[b]	1,517.63	0.147
Permanent labour	337.46	285.75	285.79	276.56	299.41	0.013***
Land rent	536.18	550.98	542.14	525.00	541.10	0.988
Administrative costs(A*0.03)	50.71	46.52	40.85	40.25	45.53	0.497
Depreciation of establishment	644.08	620.04	642.80	635.36	634.45	0.170
Greenhouse capital interest (1/2*0.05)	64.41	62.00	64.28	63.54	63.44	0.170
Total fixed costs (B)	1,632.84	1,279.54	1,575.86	1,540.71	1,583.93	0.788
Total production costs (A+B)	3,323.13	2,830.06	2,937.40	2,882.41	3,101.56	0.144

[ab] means with different superscripts on the same row are different. *** p<0.01
Source: Own calculation.

Table 9. Share of cost items in strawberry production (%)

Cost items	Farm groups (da)				Average
	I	II	III	IV	
Temporary labour	21.51	21.39	20.61	20.32	20.45
Fertilizer	6.14	6.13	6.53	6.55	6.08
Pesticide	1.71	1.36	1.45	1.20	1.42
Irrigation	4.52	5.41	5.35	5.20	4.93
Machinery rent	15.02	18.40	10.63	11.48	14.16
Revolving fund interest	1.96	2.11	1.78	1.79	1.88
Total variable costs (A)	50.86	54.79	46.35	46.55	48.93
Permanent labour	10.16	10.10	9.73	9.59	9.65
Land rent	16.13	19.47	18.46	18.21	17.45
Administrative costs (A*0.03)	1.53	1.64	1.39	1.40	1.47
Depreciation of establishment	19.38	21.91	21.88	22.04	20.46
Greenhouse capital interest (1/2*0.05)	1.94	2.19	2.19	2.20	2.05
Total fixed costs(B)	49.14	45.21	53.65	53.45	51.07
Total production costs (A+B)	100.00	100.00	100.00	100.00	100.00

Source: Own calculation.

Table 10. Gross profit, net profit and relative return in farms

Values	Farm groups (da)				Average	P-value
	I	II	III	IV		
Yield (kg/da)	4782.35	4712.50	4892.86	4687.50	4772.03	0.848
Price (TL/kg)	2.55	2.66	2.69	2.88	2.65	0.393
Strawberry production value (TL/da)	12209.07	12511.69	13149.55	13476.56	12645.89	0.857
Agricultural supports (TL/da)	5.57	4.60	3.25	2.44	4.27	0.401
Gross product value (TL/da)	12214.63	12516.29	13152.81	13479.00	12650.16	0.845
Variable costs (TL/da)	1690.29	1550.52	1361.54	1341.70	1517.63	0.124
Production costs (TL/da)	3323.13	2830.06	2937.40	2882.41	3101.56	0.120
Gross profit (TL/da)	10524.35	10965.77	11791.26	12137.31	11132.52	0.775
Net profit (TL/da)	8891.51	9686.23	10215.40	10596.59	9548.60	0.796
Relative return	3.68	4.42	4.48	4.68	4.08	0.503

Source: Own calculation.

CONCLUSIONS

In conclusion, it was determined that the average ages of producers were 46 years, their durations of education were 8 years and their agricultural experience in strawberry production was 16 years, cooperative membership share was 36 %. It was observed that more than half of the average land presence (%52.64) is comprised of strawberry fields, that the majority of producers use certified seedling and that Rubygem, Fortuna and Festival are the most frequently used strawberry varieties. Seedling costs were ranked number one among all strawberry establishment costs per decare in farms, while labor was ranked number one among all production costs. It was determined as a result of the present study that gross profit, net profit and relative return per decare increases with increasing group size. Therefore, it was determined that larger farms are more advantageous than smaller farms with regard to economic criteria.

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ECONOMIC ANALYSIS OF ALMOND PRODUCTION: A CASE STUDY OF MUGLA PROVİNCE, TURKEY

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Abstract

The purpose of the study was to carry out an economic analysis of almond production in the province of Muğla which holds an important place in Turkey with regard to almond production. The primary material of the study was comprised of original data acquired from almond producers in the Muğla province via questionnaire method. Neyman Method from among the stratified sampling methods was used for determining the number of producers to take part in the questionnaire. The number of samples to represent the population was determined as 93 according to the Neyman method. The sample farms were classified into three groups and analyses were carried out. These groups were determined according to land size as; Group I (1-10 da; 41 farms), Group II (11-20 da; 24 farms) and Group III (>20 da; 28 farms). It was calculated according to the study results that the average almond land size varies between 3.93 da and 39.06 da subject to farm groups with an average of 17.05 da. The establishment costs for almond production was determined in total as 1,089.20 $/da. Of the establishment costs, variable costs made up 65.57 % and fixed costs made up 34.43 % of the total. It was determined that the total production costs per decare in farms decreases with increasing size. Production costs per decare were calculated as 301.98 $, 260.03 $ and 227.57 $ respectively for Groups I, II and III. It was also determined that the gross profit, net profit and relative return per decare in farm groups increase with increasing farm groups. Indeed, the gross profit values per decare were determined as 319.51 $, 404.33 $ and 455.28$ respectively for Groups I, II and III, whereas the net profit values per decare were determined respectively as 218.51 $/da, 304.55 $/da and 356.45 $/da and relative return values were determined respectively as 1.72, 2.17 and 2.57. It was determined based on these indicators that the producers in the larger group are more profitable in comparison with the producers in the smaller group.

Key words: *almond, production cost, profitability*

NTRODUCTION

Almond has first been produced in Iran, Turkey, Syria and Palestine from where it was taken over to Greece, Northern Africa, Italy and Spain followed later by Northern America where significant advancements in almond production took place especially in California after 1940 [9]. Almond is used in the nut, candy, chocolate and cake industry whereas almond oil is used in the cosmetic and pharmaceuticals industries [15]. Almond holds an important place in human nutrition due to its high nutrient value and can be produced in almost all parts of the world [11]. Almond production and consumption is increasing every day due to its fat and rich mineral and vitamin content which are beneficial for human health [1,5]. Almond is among the most important nuts which have adapted to the climate of Turkey. Since seeds are used for almond production in Turkey, there is a wide range of gene potential. The current gene potential has been enriched even more with the importing of standard varieties in recent years. Even though Turkey is among the gene centers of almond, it cannot be produced economically at regions with late spring frosts since it is a fruit with very little chilling requirement. Thus, studies on late flowering almond varieties have gained attention in Turkey as is the case all over the world [9]. Almond can be produced in all regions of Turkey except the coastal regions of Eastern Black Sea and plains at very high elevations. Almond production is centered mostly in the Aegean Region of Turkey followed by the Mediterranean, Central

Anatolian and Marmara Regions. The Aegean, Mediterranean and Marmara Regions cover two thirds of the whole almond production in Turkey [7].

Almond production in the world is 3,214,303 tons. USA is the leader in the world for almond production with a share of 62.31%. Turkey takes up a share of about 2.64 % in the worldwide almond production with a production of about 85,000 tons [4]. The province of Muğla where the study is carried out has a share of about 11 % ranking 3rd after Mersin and Antalya [13].

The purpose of this study was to carry out an economic analysis for almond production in the city of Muğla which has a significant potential for almond production. For this purpose, the general features of almond producers according to different farm groups such as population, education, age, experience, average land size as well as activity results such as inputs and costs for the establishment and production period, gross product value, gross profit, net profit and relative return will be determined and these results will be compared according to farm groups. Studies in Turkey have mostly focused on the technical aspect of almond production. The number of studies examining almond production economically has remained limited. It is hoped that the findings acquired from the present study will be beneficial for almond producers, researchers and related institutions.

MATERIALS AND METHODS

The main material of the study was comprised of original data collected via survey method from almond producer farms in the districts of Datça, Marmaris, Fethiye and Seydikemer located in the province of Muğla. In addition to primary data, similar studies carried out by related individuals and institutions, statistics and reports have also been used. The data cover the 2015 production season.

District centers of Datça, Marmaris, Fethiye and Seydikemer along with 22 villages in these districts were selected as the study area where almond production is carried out intensively based on information acquired from the technical staff of Muğla Provincial Directorate of Food, Agriculture and Livestock as well as related records. All farms in these districts and villages that are suited to the purpose of the present study make up the population of the study. The districts selected as the study area make up about 72% of the total almond production in the Muğla province [13]. Hence, it can be stated that the study region has the required features for representing the almond producer farms in the Muğla province.

Neyman Method from among the stratified sampling methods was used for determining the number of samples to be included in the questionnaire [16]. The number of samples was calculated using Equation 1.

$$n = \frac{(\sum Nh\ Sh)^2}{N^2\ D^2 + \sum Nh\ Sh^2} \quad (1)$$

Here:
n: Number of samples
N: Total number of units in the population ı
Nh : Number of units in group h
Sh: Standard deviation of group h
Sh^2: Variance of group h
D^2: d^2 / z^2
d^2: Allowed error from the population average (5 % deviation from the average)
z^2: The value in the distribution table for the allowed confidence interval (A confidence interval of 95 % was predicted in the study).

The number of samples to represent the main population was calculated as 93 using Equation 1 (Table 1). The farms to be included in the questionnaire will be selected randomly. Since the almond lands of the farms differ significantly, it was decided to examine the almond farms by classifying them into different groups in order to attain population homogeneity. The almond producers were thus classified into three groups according to frequency distribution taking into consideration their land sizes. Equation 2 was used for the classification of the farms into groups [16].

$$n_h = \frac{N_h S_h}{\sum N_h S_h} * n \quad (2)$$

where:
n_h: the number of samples selected for each group
n: total number of samples.

Accordingly; farms with a land size of 1-10 decares (41 farms) were classified as Group I, farms with a land size of 11-20 decares (24 farms) were classified as Group II and farms with a land size of >20 decares (28 farms) were classified as Group III. Questionnaire data were analyzed using package software such as Microsoft Excel and SPSS.
Foreign labor wages in the study area were taken as basis for calculating the family labor wage equivalent. Unit machinery rental fees were taken as basis for calculating the machinery expenses in the study. General administrative costs were calculated as 3% of the total variable costs. Revolving fund interest was calculated by applying half of the current interest rate applied by T.C. Ziraat Bank on plant production credits. Bare land value interest was calculated by taking 5% of the bare land value in the study area. Establishment costs annual depreciation share was calculated by dividing the total establishment costs made during the establishment period (4 years) to the economic life of the almond establishment (50 years). Whereas establishment capital interest was applied as 5% to half of the total establishment costs [8]. Gross profit, net profit and relative return calculations were made to put forth the profitability of almond production. Gross profit was calculated by subtracting the variable costs from the gross production value. Net profit was calculated by subtracting the production expenses from the gross production value. Whereas relative return was calculated by dividing the gross production value to the production costs [10].

RESULTS AND DISCUSSIONS

Table 2 shows the producer features. There were no significant differences between the average age, agricultural experience and experience in almond production of the producers. It was determined based on the average of all farmer groups that the average age of the producers is 57.70 years, agricultural experience average was 39.36 years and experience in almond production average was 37.63 years. Almond land size of the producers was calculated according to the farm groups as varying between 3.93 da and 39.06 da with an average value of 17.05 da. Family population was highest in Group I (3.43 person/family) and lowest in Group III (2.92 person/family). Cooperative membership ratio was highest in Group III (53.57 %) and lowest in Group I (43.90 %). Involvement in farmer registration system was observed to be highest in Group II (62.50 %) and lowest in Group I (39.02 %). It was determined that the producers generally have social security. The ratio of producers with social security was calculated based on the average of all farms as 96.42 %.
Table 3 shows the education levels of the producers. It was determined that majority of the producers are primary school graduates in all groups. The ratios of primary school graduate producers were determined for Groups I, II and III as 68.29 %, 62.50 % and 50 % respectively. The ratio of university graduate producers was determined to be low in all groups. The ratio of university graduate producers based on the average of all farm groups was calculated as 4.30 %.
Table 4 presents the ratio of producers that produce different almond varieties. It was determined that the producers in the study area produce 9 different almond varieties. However, the ratios of producers that produce these almond varieties are different. It was determined that almost all of the producers in especially Groups II and III are producing Nurlu and Ak almond varieties, whereas it was also determined that the producers in Group I have not focused on a certain variety.

Table 1. Distribution of farms by farm groups and number of sample farms for each group

Farm groups (da)	Number of farms (Nh)	Standard deviation (Sh)	Variance $(Sh)^2$	(Nh)*(Sh)	$(Nh)*(Sh)^2$	Number of sample farms (n)
1-10	379	2.32	5.40	880.45	2,045.38	41
11-20	167	3.03	9.19	506.28	1,534.85	24
21+	119	4.95	24.52	589.23	2,917.62	28
Total	665	10.3	39.11	1,975.96	6,497.85	93

Source: Own calculation.

Table 2. Producers' features

Features	Farm groups			Average
	I	II	III	
Age (year)	58.15	57.25	57.43	57.70
Agricultural experience (year)	40.07	37.63	39.79	39.36
Experience in almond production (year)	38.78	35.33	37.93	37.63
Almond land size (da)	3.93	13.77	39.06	17.05
Population (person/family)	3.43	4.14	2.92	3.46
Membership of cooperative (%)	43.90	37.50	53.57	45.16
Involvement in farmer registration system (%)	39.02	62.50	42.85	46.24
Ratio of producers with social security (%)	97.56	87.50	96.43	94.62

Source: Own calculation.

Table 3. Producers' education level

Education level	Farm groups (da)						Total	
	I		II		III			
	N	%	N	%	N	%	N	%
Primary school	28	68.29	15	62.50	14	50.00	57	61.29
Secondary school	8	19.51	4	16.67	5	17.86	17	18.27
High school	5	12.20	4	16.67	6	21.43	15	16.13
University	-	-	1	4.16	3	10.71	4	4.30
Total	41	100.00	24	100.00	28	100.00	93	100.00

Source: Own calculation.

Table 4. Different almond varieties and usage rates in farms (%) *

Almond varieties	Farm groups (da)			Average
	I	II	III	
Nurlu	34.15	100.00	96.43	69.89
Ak	39.02	100.00	100.00	73.12
Sıra	14.63	12.50	14.29	13.98
Diş bademi	7.32	4.17	7.14	6.45
Kababağ	14.63	29.17	32.14	23.66
Rüştü	17.07	45.83	39.29	31.18
Hacıeli	7.32	4.17	7.14	6.45
Haşmet	4.88	4.17	7.14	5.38
Carmel fıstık badem	12.20	4.17	7.14	8.60

*percentages are higher than 100 because of multiple choice
Source: Own calculation.

It was observed that the ratios of producers producing Nurlu and Ak almond varieties in Group I are 34.15 % and 39.02 % respectively.

Since almond is a perennial plant, costs were calculated for two different periods. These are the establishment and production periods. Costs were calculated first for the establishment period (4 years) after which the costs were calculated for the production period once yield is attained. Table 5 presents the costs and distributions for the expenses of

producers related with the establishment period. As can be seen in the Table, total almond establishment cost was determined as 1,089.20 $/da. It was determined that 65.57 % of the total establishment costs make up the variable costs and that 34.43 % make up the fixed costs. It can be observed upon examining the establishment period costs that the costs during the first year are higher in comparison with the other years. This is due to the higher costs involved in the sapling and planting costs during the first year.

Almond production costs were analyzed by classifying the costs as fixed and variable. Variable costs are those that increase or decrease subject to the production volume. These expenses emerge at the time of production and vary subject to the amount of production. Whereas fixed costs are those that do not vary with production volume which are always present regardless of whether production is made or not [6]. Almond production cost items and their ratios are presented in Table 6. As can be seen in the table, it was determined that total production cost per decare in the farms decrease with increasing group size. Production costs per decare were calculated for Groups I, II and III as 301.98 $, 260.03 $ and 227.57 $ respectively. It was determined that variable costs make up a significant portion of the total production costs in all farm groups. The shares of variable costs in total production costs were calculated for Groups I, II and III as 65.55 %, 61.63% and 56.57 % respectively. It was determined that the share of the variable costs in total production costs decrease with increasing farm groups and that the share of the fixed costs increase. Variable costs in almond production are comprised of fertilizers and fertilization, deep plowing, hoeing, pruning, harvest and fruit thinning and revolving fund interest while fixed costs are comprised of administrative costs, land rent, establishment depreciation and establishment capital interest. Beigi *et al.* (2016) [2] carried out a study in which it was reported that the total cost of production was \$4,547.54, \$5,799.26 and \$5,687.05 ha^{-1} in the three orchard groups (6–10 years old: Group I, 11–15 years old: Group II and 15–20 years old: Group III) respectively. It was revealed that variable expenditure share in Groups I and III was slightly higher than fixed expenditure share, where the fixed and variable expenditure shares for Group II are 49.85 % (\$2,890.86 ha^{-1}) and 50.15 % (\$2,924.36 ha^{-1}), respectively.

Table 7 shows the income of almond producers from almond production. The producers market a certain amount of the almond as green and the remainder as dried almond. It was determined that the gross product value increases with increasing farm size. Gross product value per decare was determined for Groups I, II and III as 520.49 $, 564.57 $ and 584.02 $ respectively. It was determined that the green almond and dried almond have similar shares in total gross product value in Group I, whereas it was also determined that the shares of dried almond in Groups II and III are higher.

Gross profit is a success indicator for determining the competitive power of production activities with regard to the use of scarce production factors in a farm. In other words, it is a significant criterion that puts forth the success of a farm organization [3]. Table 8 shows the gross, net profit and relative return per decare according to farm size groups in the study region. As can be seen in the table, gross profit increases with increasing farm size groups. Indeed, gross profit per decare was determined for Groups I, II and III as 319.51 $, 404.33 $ and 455.28$ respectively. Net profit is another success criteria used for comparing business activities. Gross profit includes fixed costs, however there is no expense element included in the net profit. As was the case for gross profit, net profit was also determined to increase with increasing farm size. Net profit values were calculated for Groups I, II and III as 218.51 $/da, 304.55 $/da and 356.45 $/da respectively. Tariq (2011) [12] carried out a study in which it was reported that the almond production was profitable and economically. It was reported that since, almond is proven to be economically profitable, new areas suitable may be brought into almond cultivation

orchards by providing bank loans at a cheaper rate of interest. Relative return corresponds to the profit from a unit cost. It was determined as a result of the calculations made that relative return increases with increasing farm group size as is the case for other profitability indicators. Relative return values were determined as 1.72 for Group I, 2.17 for Group II and 2.57 for Group III. Accordingly, it was determined that the producers in large groups are more advantageous with regard to economic criteria in comparison with producers in small groups. Ukav (2017) [14] carried out a study in which almond production relative return was determined as 2.54. In a study conducted by Beigi et al. (2016) [2] the average benefit to cost ratio from the almond production in the studied region was calculated to be 5.10, with a minimum value of 4.19 (for Group I) and a maximum value of 6.30 (for Group II), which means that almond production was a profitable operation in Iran.

Table 5. Almond establishment costs in farms

Years	Variable costs ($/da)	%	Fixed cost ($/da)	%	Total costs ($/da)	%
1. year	305.67	78.10	85.69	21.90	391.36	100.00
2.year	134.03	56.90	101.53	43.10	235.56	100.00
3.year	136.15	59.16	93.99	40.84	230.14	100.00
4.year	138.36	59.60	93.78	40.40	232.14	100.00
Total	714.22	65.57	374.98	34.43	1089.20	100.00

Source: Own calculation

Table 6. Production costs in farms

Cost items	Farm groups (da)						Average	
	I		II		III			
	$/da	%	$/da	%	$/da	%	$/da	%
Fertilizers and fertilization	31.57	10.45	30.43	11.70	25.51	11.21	29.45	10.96
Deep plowing	25.14	8.33	30.51	11.73	33.63	14.78	29.08	10.82
Hoeing	10.00	3.31	10.29	3.96	6.29	2.76	8.96	3.33
Pruning	30.65	10.15	20.87	8.02	13.14	5.77	22.85	8.50
Harvest	47.82	15.84	38.87	14.95	23.06	10.13	38.06	14.16
Fruit thinning	48.07	15.92	23.11	8.89	22.16	9.74	33.83	12.59
Revolving fund interest	7.73	2.56	6.16	2.37	4.95	2.18	6.49	2.41
A. Total variable costs (A)	200.98	66.55	160.25	61.63	128.74	56.57	168.72	62.78
Administrative costs (A*0.03)	6.03	2.00	4.81	1.85	3.86	1.70	5.06	1.88
Land rent	45.96	15.22	45.96	17.67	45.96	20.19	45.96	17.10
Establishment depreciation	21.78	7.21	21.78	8.38	21.78	9.57	21.78	8.11
Establishment capital interest	27.23	9.02	27.23	10.47	27.23	11.97	27.23	10.13
B. Total fixed costs (B)	101.00	33.45	99.78	38.37	98.83	43.43	100.03	37.22
C. Total production costs (A+B)	301.98	100.00	260.03	100.00	227.57	100.00	268.75	100.00

Source: Own calculation

Table 7. Gross product value in farms

Income items	Farm groups (da)						Average	
	I		II		III			
	$/da	%	$/da	%	$/da	%	$/da	%
Green almond	267.29	51.35	227.50	40.30	247.73	42.42	251.13	45.58
Dried almond	253.20	48.65	337.07	59.70	336.29	57.58	299.86	54.42
Gross product value	520.49	100.00	564.57	100.00	584.02	100.00	550.99	100.00

Source: Own calculation.

Table 8. Profitability indicators in farms

Profitability indicators	Farm groups (da)			Average
	I	II	III	
Gross product value ($/da)	520.49	564.57	584.02	550.99
Variable cost ($/da)	200.98	160.25	128.74	168.72
Production costs ($/da)	301.98	260.03	227.57	268.75
Gross profit ($/da)	319.51	404.33	455.28	382.28
Net profit ($/da)	218.51	304.55	356.45	282.24
Relative return	1.72	2.17	2.57	2.05

Source: Own calculation.

CONCLUSIONS

The average age of the producers was calculated as 57.70 years, whereas their almond production experience duration is 37.63 years and that the population is 3.46 people.

The cooperative membership ratio was determined to be higher in larger companies. It was determined that majority of the producers are primary school graduates. It was determined that production expenses per decare increases and that gross profit, net profit and relative return have increased. The share of the variable expenses in total production costs was determined as 32.78% whereas the share of the fixed costs was determined as 37.22 %.

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INTEGRATION OF COMPONENTS OF THE MECHANISM OF REALIZATION OF PRIORITIES OF SCIENTIFIC AND INTELLECTUAL POTENTIAL OF AGRI-FOOD COMPLEX

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Abstract

Agricultural science has a large number of completed developments that can significantly improve the efficiency of production and there is a need for mechanisms for their implementation. The purpose of the article is to clarify the methodological provisions of the assessment of scientific and intellectual potential, and identify priorities of such an activity, as well as substantiate scientific and methodological foundations of formation of the mechanism of implementation of the priorities found. The article summarizes the approaches to the assessment of innovations. Key indicators of the knowledge economy are adapted to assess the scientific and intellectual potential of the agri-food complex. In the study, the calculation of specific indicators of efficiency and effectiveness of the scientific and intellectual potential was made, and trends were revealed in the influence of the increase research expenditures on increasing the innovative activity. The analysis of statistical information showed that differentiation of the regions of the Russian Federation in terms of the level and effectiveness of innovative development is increasing, which indicates the need to strengthen the mechanisms of regulation of innovative development. The study discusses the features of the use of interrelated mechanisms of scientific and intellectual potential of the agri-food complex. It is proposed to increase the effectiveness of the institutional environment through the formation of regional centers of forecasting and scientific and technical policy. The directions of transformation of the Russian institutional environment and innovative infrastructure which allow applying the specified mechanisms in agri-food complex at the regional level are offered in the article.

Key words**:** *scientific and intellectual potential, agri-food complex, innovation activity, effectiveness evaluation, implementation mechanisms, management strategy, food safety*

INTRODUCTION

The state of the agri-food complex to a high degree determines the state of the country's economy, since it is closely linked economically with other sectors of the national economy. Agrarian science has a large number of completed developments that can significantly improve production efficiency. However, the massive promotion of innovations in the farms proceeds rather slowly, resulting in a fact that significant part of domestic developments remains unclaimed every year and the current level of development of innovative processes in culture is estimated as ambiguous. In the area of agrarian science fruitfully working in recent years despite serious economic difficulties, a large number of high-quality scientific products are created, and avant-garde cultural producers, coping with unfavorable economic factors, master progressive technologies. The current negative situation and the drop in demand for scientific-technical and high-tech products have determined the delay in the development of innovation process.

The tasks of creating an effective market for innovative products in the agri-food sector as well as effective mechanisms for stimulating demand for it, along with enhancing competitiveness and ensuring food security, are the most important in the development of innovative activities in the domestic agri-food complex [23].

Successful implementation of the strategic objectives of development of the agri-food sector in the context of integrated transformations is impossible without a mechanism to increase the level of

competitiveness of domestic producers in an increasingly competitive environment [20]. The world theory and practice proved that the most effective adaptation mechanism in market conditions is the mechanism based on the system interaction of innovative development tools. The formation and implementation of such a mechanism in the practical activities of enterprises of the cultural sector is currently an indispensable condition for entering the world markets. Along with this, modern realities show that the trend of export success and the appearance of foreign companies in the domestic agri-food market bring not only new opportunities, but also form quite real threats to the loss of competitive positions of domestic production [18]. An effective tool for protection and building up of competitive potential can be an innovative policy of farmers, which requires constant systemic adaptation in the dynamic factors of the market environment [4]. In this case, there is an objective need for continuous improvement of the mechanism for implementing the innovation potential and as one of its main components, the scientific and intellectual potential of the agri-food complex. In addition, it is necessary to adjust its main elements and levers, the nature of the interaction of which should be based on the results of continuous and comprehensive monitoring of the market for cultural raw materials and food. The economic growth is benefic for a country as it is closely related to the increase of wealth, wellness and living standard. The economic growth is a complex concept and for this reason a system of specific indicators is required to be used for a profound analysis [19].

The object of the research is the scientific and intellectual potential of the subjects of innovation process in the agri-food complex.

The purpose of the article is to assess the current level of innovation activity of entrepreneurial structures of agri-food production and substantiate the scientific and methodological foundations for the formation of the mechanism for implementing the scientific and intellectual potential of the agri-food complex subjects.

At the present stage of development of the agri-food complex, the dynamic development of its main areas is impossible without creating an effective mechanism for innovative development of agri-food structures. In developed countries, the degree of competitiveness of the economy as a whole, its individual sectors, business entities, as well as goods and services, is determined precisely by the level of innovation in production and management. The development of the innovation sphere is closely interconnected with the intensification of investment activity, which forms the fundamental basis of scientific research and implementation of innovation projects.

Innovative development of culture is constrained by imperfection of the existing system of encouraging innovation, an effective mechanism for the transfer of science to production. Particular important in the field of innovation and investment support for culture is budgetary and administrative state support, namely, the state institutional structure, quantitative and qualitative measures of national support: federal and regional, foreign economic support measures [25].

The problem of growing investment in culture is a key to developing the competitiveness of the Russian economy. To improve the effectiveness of innovation policy, it is advisable to study forms of state participation and substantiate conceptual theoretical and practical proposals for the development of state support for innovation. The organizational and economic mechanism with an insufficiently developed system of planning and coordinating of basic and applied research leads to an incomplete use of innovative potential of cultural production [6]. At the same time, in Russia, some sectors are building up the potential for innovative development, their products are being exported. Among such industries can be distinguished poultry, beet and pig. At present, despite the growth in the introduction of innovative technologies, there is still a limited nature of their distribution and availability of sales to only a small number of

large cultural producers. In accordance with the Strategy for Scientific and Technological Development of the Russian Federation, approved by Decree of the President of the Russian Federation dated December 1, 2016 No. 642, the current stage of development is characterized by the presence of both competitive advantages and unresolved problems that hinder the scientific and technological development of the country [21].

MATERIALS AND METHODS

Currently, preparations are underway for the creation of research and educational centers, integrating the capabilities of universities, academic institutions, and high-tech companies. The first such a center was established in the Belgorod region, it would bring together scientists and representatives of the business community, who are actively involved in the development of biotechnology in the "smart" agri-industrial complex [3].

At the same time, there are significant differences among scientific and educational organizations in terms of performance indicators and work efficiency, uneven distribution of research potential throughout the country [13]. According to the Strategy, the problems of insufficient coordination of the functioning of research and development institutions with branches of the economy impede the scientific and technological development of Russia. In accordance with the Program “Digital Economy of the Russian Federation”, approved by the decree of the Government of the Russian Federation of July 28, 2017 No. 1632-r., as well as by the Decree of the President of the Russian Federation of May 7, 2018 No. 204 “On the national goals and strategic objectives of the Russian Federation for the period up to 2024 "the task is to increase the domestic costs of the development of the digital economy at the expense of all sources (by share in the gross domestic product of the country) at least three times compared with 2017; the creation of sustainable and secure information and telecommunication infrastructure for high-speed transmission, processing and storage of large amounts of data that is accessible to all organizations and households; the use of primarily domestic software by government agencies, local governments and organizations. The promising areas of the Program are following: “Smart City”, “Transport and Logistics”, “culture”, “Healthcare”, “State Management”, “Energy”, “Industry”, “Construction”. By 2024, it is planned to allocate 521 billion rubles.

In the studies of Andryushchenko S.A., the priorities for the implementation of the scientific and intellectual potential of the - food complex on the basis of the materials of the National Projects "Science" are highlighted [17] and “International cooperation and export” Federal Scientific and Technical Program for the Development of culture for 2017–2025 Resolution of the Government of the Russian Federation of August 25, 2017 N 996 "On Approval of the Federal Scientific and Technical Program development of culture for 2017-2025, the State Program for the Development of culture and Regulation of cultural Products, Raw Materials and Food Markets (as amended on February 8, 2019) [9]: Development and transfer of innovations, Diffusion of innovations, Biologization of technologies used in culture, Creating conditions for attracting credit resources, Updating the fleet of cultural equipment, Effective use fixed assets and investments, growth in production in the food industry [2].

In modern conditions, the assessment of innovative potential is one of the main tools for studying the effectiveness of public administration in the innovative development of culture and agri-food complex of Russia [11]. It is well known that an effective system of management of innovative development requires a sound system of performance indicators in comparison with its performance.

Measuring and assessing the scientific and intellectual potential as an integral part of the innovation potential of the agri-food complex is closely linked to the production potential of the national economy as a measure of its effectiveness [10]. The scientific and

intellectual potential is a relatively stable and independent unit in the Russian economy, since it is formed on the basis of the supply and demand of world markets for the results of intellectual labor.

The knowledge economy is the source of the sustainable development of society by overcoming the fundamental limitation of the economy — non-renewable resources. The main inexhaustible resource is ideas and creativity. A resource, in principle, unlimited and inexhaustible, in the knowledge economy is ideas as a result of human creativity. The human capital factor is the most important source of economic growth; it substantiates the role of education, science, and health care, which previously erroneously belonged to non-productive activities. In general, the transition to sustainable development of society based on the knowledge economy is understood as transition to the economy of the fifth and sixth technological order.

The prospects for the development of the scientific and intellectual potential of culture and agri-food sector as a whole are determined by the laws of scientific and technological progress, the theory of cycles, the theory of economic development of J. Schumpeter, as well as theories of economic growth, theories of post-industrial, information society and the knowledge economy, etc.

In the study of methodological approaches to the analysis and evaluation of scientific and intellectual potential, there are significant differences [16].

A number of sources suggest a resource approach [14]. It is based on the idea of scientific and intellectual potential as a combination of natural, material, financial, and information resources. This approach expresses the ability of an economy to master and use knowledge in order to effectively manage the economy.

RESULTS AND DISCUSSIONS

To increase the effectiveness of the implementation of the scientific and intellectual potential of agri-food complex, it is necessary to conduct a preliminary analysis of strengths and weaknesses, analysis of opportunities and threats when introducing the results of scientific and intellectual activities. Based on the adaptation of the theory of systems to the organization of management of the scientific and intellectual potential of the agri-food complex, a comprehensive review of informational, scientific, design, technological, production, marketing, economic, managerial and social components is proposed, ensuring their mutual influence and complementarity in order to ensure the synergy and the end goals of innovation activities of enterprises [12]. Table 1 presents the data of Rosstat on the dynamics of indicators of costs for technological innovations and the effectiveness of innovation activities as an example - the development of new products and the number of patents obtained [24].

They show that in 2008-2016 despite the growth in the cost of technological innovation, including that in agri-food sector, innovation activity remains low, and there are significant imbalances in some industries.

Table 1. Indicators of the cost of technological innovation and performance of innovation activities of the Russian Federation in 2008-2016

Indicator	2008	2009	2010	2011	2012	2013	2014	2015	2016
Costs for technological innovation, total (million rubles)	276.2	358.8	358.8	733.8	904.5	111.2	1,211.9	1,203.6	1,284.6
Costs for technological innovation of agricultural enterprises, (million rubles)	12.18	10.84	8.76	12.56	16.90	29.97	25.86	25.02	23.96
Developed new food items	1167	-	-	528	400	364	392	214	192
Received patents and copyright certificates	722	-	-	735	724	755	751	741	738

Source: Rosstat data.

To assess the effectiveness of innovation development based on the knowledge economy, it is also important to take into account demand indicators: import substitution of technological services, as well as technologies in general; the number of organizations performing research work, as well as those engaged in the development of innovative technologies; funds spent by the organization on internal research and development; the amount of advanced technology used at the production level; technological innovation costs [8]. In addition, it is necessary to take into account also the proposals of knowledge, among which are: Universities, graduating specialists of different levels; organizations working with graduate or doctoral students; the number of personnel engaged in research activities; share of patents granted; number of employees with a degree; the number of innovative technologies created by the company.

An indirect reflection of the demand for innovative products is the number of applications for patents and inventions and, accordingly, the statistics of their issuance, as well as the value of developed and used advanced production technologies.

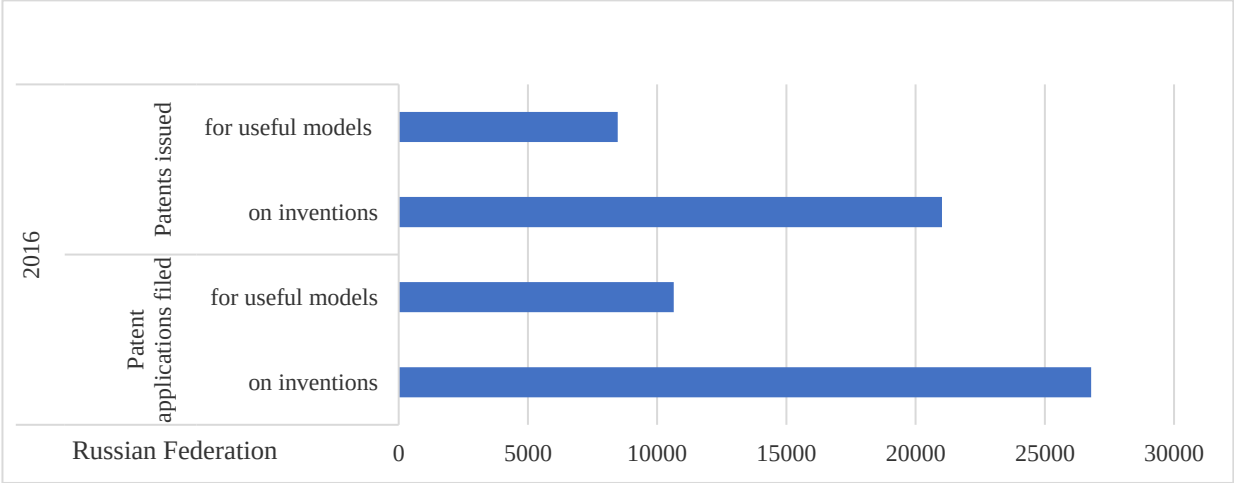

Fig.1. Filing of patent applications and issuance of patents in the Russian Federation in 2016
Source: Own determination.

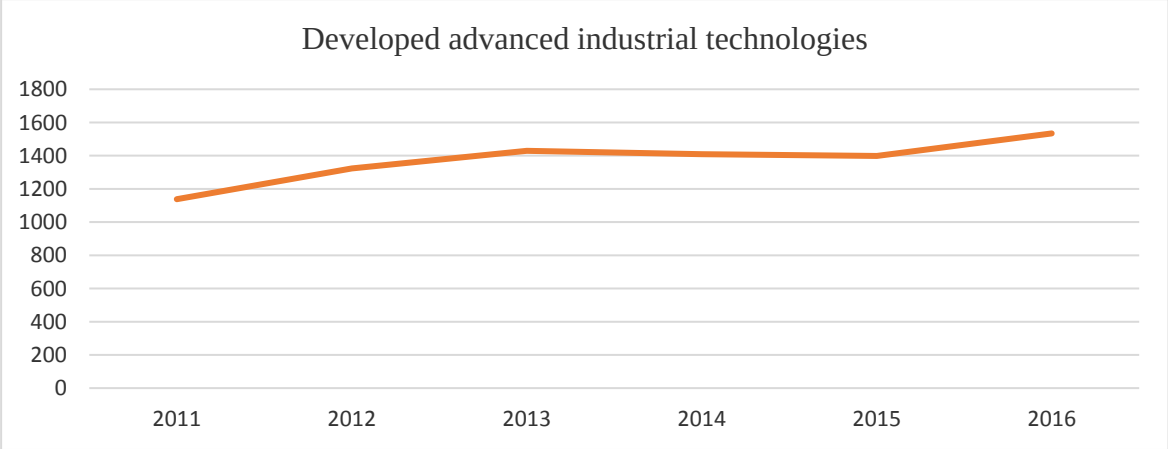

Fig.2. The dynamics of the number of developed advanced production technologies in the Russian Federation in 2011-2016
Source: Rosstat data.

According to Figure 1, it can be seen that the figures for filing and issuing patent applications for inventions are 2.5 times higher than those for applications for utility models.

Analysis of Figure 2 shows that, in Russia as a whole, the indicator “Developed advanced production technologies” has an upward trend

line, while the indicator fell from 2013 to 2015, and in 2016 compared to 2015, the increase was 10% The indicators of the scientific and intellectual potential performance include such indicators as: developed advanced production technologies; the number of used advanced manufacturing technologies; the ratio of the number of advanced production technologies to the number used; number of patent applications filed; coefficient of inventive activity (the number of domestic patent applications for inventions filed in the Russian Federation, per 10 thousand people. population). And also the Information and statistical material "The effectiveness of research and development". The indicators of the effectiveness of scientific and intellectual potential include: the degree of innovativeness of organizations (the share of innovative products in the total volume of sales of organizations implementing innovations),%; number of advanced production technologies created per R & D organization, units on the organization; the number of advanced production technologies created per 1 thousand people employed in R & D; the number of advanced production technologies created by 1 billion rubles, and domestic R & D costs.

The paper proposes the calculation of specific indicators of efficiency and effectiveness of scientific and intellectual potential.

Table 2 and Figure 3 show the dynamics of internal research expenditures (million rubles) per employee engaged in research and development.

Table 2. The internal research costs per employee engaged in R & D in the Volga Federal district of the Russian Federation, for 2005-2016, million rubles

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Republic of Bashkortostan	0.17	0.24	0.34	0.42	0.46	0.53	0.67	0.86	0.88	1.00	1.01	1.11
Mari El Republic	0.18	0.30	0.52	0.80	0.55	0.73	0.74	0.83	1.06	0.57	0.71	0.60
The Republic of Mordovia	0.19	0.24	0.35	0.40	0.54	0.58	0.65	0.74	0.96	1.10	0.83	0.86
Republic of Tatarstan	0.21	0.29	0.35	0.43	0.43	0.49	0.65	0.76	0.85	1.02	0.96	1.03
Udmurtia Republic	0.24	0.22	0.33	0.27	0.37	0.30	0.39	0.58	0.70	0.60	0.69	0.61
Chuvash Republic	0.11	0.15	0.33	0.44	0.48	0.69	0.90	0.93	1.10	1.15	1.06	1.03
Perm Krai	0.32	0.39	0.53	0.62	0.73	0.76	0.83	0.95	1.18	1.11	1.18	1.36
Kirov region	0.20	0.22	0.26	0.33	0.46	0.53	0.53	0.61	0.64	0.76	0.82	0.87
Nizhny Novgorod Region	0.30	0.36	0.46	0.54	0.60	0.77	0.91	1.09	1.04	1.47	1.64	1.88
Orenburg region	0.22	0.25	0.44	0.53	0.50	0.51	0.59	0.62	0.72	0.79	0.68	0.50
Penza region	0.20	0.20	0.22	0.26	0.31	0.40	0.58	0.67	0.81	0.62	0.63	0.81
Samara Region	0.31	0.39	0.41	0.44	0.55	0.62	0.92	1.02	1.13	1.13	1.37	1.23
Saratov region	0.16	0.17	0.26	0.34	0.37	0.47	0.56	0.65	0.57	0.70	0.68	0.82
Ulyanovsk region	0.32	0.35	0.43	0.50	0.59	0.68	1.14	1.22	1.23	1.25	1.70	1.71

Source: Rosstat data.

According to the results of the analysis, it is clear that the largest share of the internal expenditures on scientific research per employee engaged in research and development in the Volga Federal District of the Russian Federation for 2005-2016 holds the Nizhny Novgorod Region, the Ulyanovsk Region, the Perm Krai, the Samara Region, the Republic of Bashkortostan, the Republic of Tatarstan.

Table 3 and Figure 3 show the dynamics of the proportion of the population engaged in research and development in the total number of people employed in the economy in the Volga Federal District in 2005-2016.

Table 3. Share of employees engaged in research and development in the total number of employed in the economy in the Volga Federal district in 2005-2016, as a percentage

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Republic of Bashkortostan	0.47	0.44	0.45	0.44	0.42	0.43	0.46	0.45	0.47	0.47	0.46	0.46
Mari El Republic	0.30	0.16	0.14	0.06	0.06	0.05	0.06	0.05	0.06	0.08	0.07	0.09
The Republic of Mordovia	0.28	0.27	0.27	0.33	0.31	0.23	0.24	0.24	0.25	0.24	0.25	0.24
Republic of Tatarstan	0.81	0.79	0.73	0.71	0.71	0.73	0.73	0.75	0.72	0.66	0.65	0.62
Udmurtia Republic	0.27	0.26	0.21	0.22	0.19	0.20	0.27	0.19	0.22	0.23	0.22	0.25
Chuvash Republic	0.24	0.18	0.12	0.19	0.17	0.16	0.17	0.23	0.23	0.24	0.23	0.27
Perm region	1.01	0.86	0.78	0.73	0.75	0.75	0.75	0.77	0.81	0.84	0.92	0.86
Kirov region	0.29	0.27	0.29	0.28	0.27	0.25	0.26	0.28	0.26	0.29	0.29	0.28
Nizhny Novgorod Region	2.88	2.68	2.52	2.43	2.38	2.38	2.35	2.40	2.46	2.37	2.42	2.52
Orenburg region	0.09	0.09	0.10	0.10	0.10	0.09	0.09	0.08	0.07	0.07	0.10	0.15
Penza region	1.04	1.05	1.06	0.98	0.91	0.93	0.96	0.89	0.84	0.86	0.92	0.74
Samara Region	1.55	1.57	1.47	1.29	1.35	1.34	1.04	1.15	1.11	0.86	0.73	0.56
Saratov region	0.57	0.54	0.49	0.45	0.42	0.41	0.40	0.39	0.42	0.40	0.46	0.47
Ulyanovsk region	1.31	1.25	1.16	1.20	1.23	1.26	1.14	1.15	1.18	1.19	0.90	0.87

Source: Rosstat data.

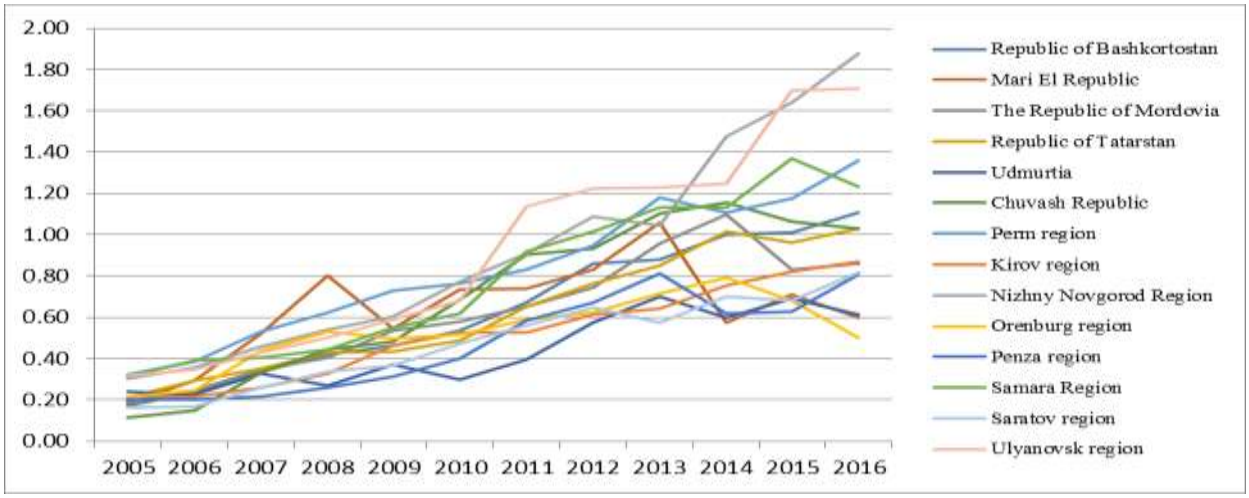

Fig.3. Dynamics of the the internal research costs per employee engaged in research and development in the Volga Federal District of the Russian Federation for 2005-2016 (million rubles)
Source: Own determination.

The analysis shows that the highest value of this indicator is typical for the Nizhny Novgorod Region, the Ulyanovsk Region, the Perm Territory, the Penza Region, and the Republic of Tatarstan.

Table 4 and Figure 4 show the dynamics of the share of patents per employee engaged in research and development in the Volga Federal District of the Russian Federation for 2005-2016.

The analysis shows that the largest share of the number of patents granted per employee engaged in research and development is typical for the Republic of Mari El, the Republic of Bashkortostan, the Chuvash Republic, the Orenburg region, the Republic of Tatarstan.

Table 4. The number of patents granted per employee engaged in research and development in the Volga Federal District of the Russian Federation for 2005-2016

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Republic of Bashkortostan	0.05	0.07	0.05	0.06	0.08	0.06	0.05	0.07	0.06	0.06	0.09	0.06
Mari El Republic	0.08	0.19	0.14	0.48	0.57	0.48	0.31	0.45	0.53	0.51	0.41	0.19
The Republic of Mordovia	0.02	0.05	0.03	0.02	0.04	0.03	0.04	0.03	0.04	0.04	0.07	0.04
Republic of Tatarstan	0.04	0.07	0.04	0.05	0.05	0.05	0.04	0.05	0.05	0.07	0.07	0.05
Udmurtia	0.06	0.12	0.07	0.07	0.12	0.08	0.04	0.06	0.05	0.06	0.06	0.05
Chuvash Republic	0.05	0.12	0.10	0.10	0.12	0.10	0.10	0.09	0.10	0.08	0.10	0.08
Perm region	0.03	0.05	0.04	0.04	0.05	0.04	0.03	0.04	0.03	0.03	0.03	0.02
Kirov region	0.04	0.06	0.03	0.04	0.04	0.05	0.03	0.03	0.04	0.04	0.05	0.03
Nizhny Novgorod Region	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Orenburg region	0.11	0.14	0.07	0.08	0.08	0.11	0.12	0.10	0.11	0.13	0.07	0.06
Penza region	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02
Samara Region	0.02	0.04	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.04
Saratov region	0.03	0.07	0.04	0.05	0.06	0.05	0.05	0.06	0.05	0.04	0.04	0.03
Ulyanovsk region	0.03	0.07	0.03	0.03	0.03	0.02	0.03	0.03	0.02	0.02	0.05	0.03

Source: Rosstat data.

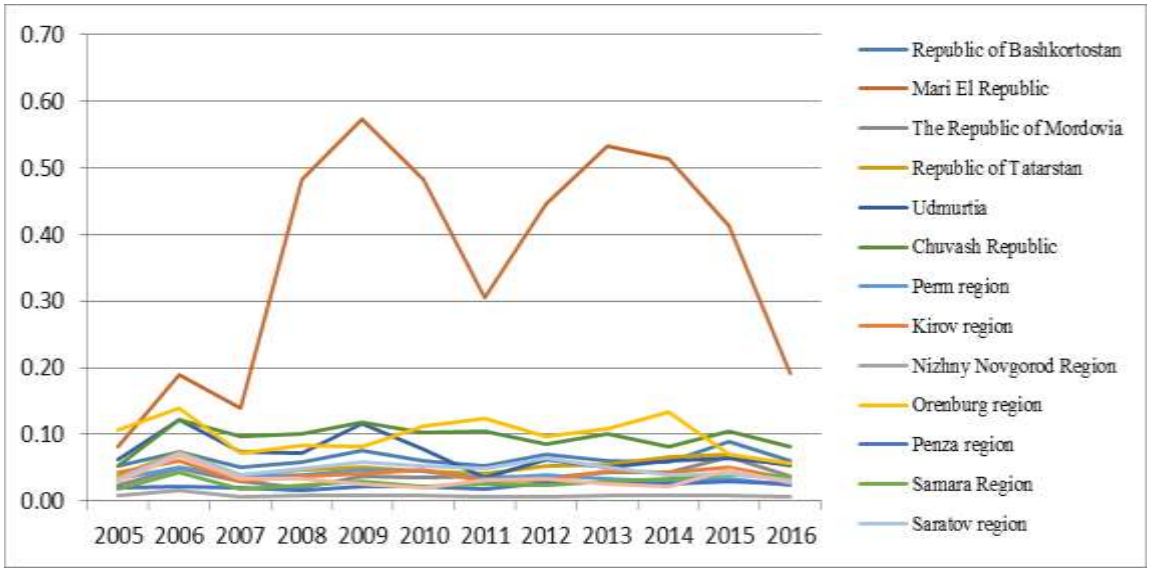

Fig. 4. Dynamics of the share of the number of patents issued per employee engaged in research and development in the Volga Federal District of the Russian Federation for 2005-2016.
Source: Own determination.

Table 5 and Figure 5 show the dynamics of the number of developed advanced production technologies per employee engaged in research and development in the Volga Federal District of the Russian Federation for 2005-2016.

The analysis shows that the highest value of the number of developed advanced production technologies per employee engaged in research and development is typical for the Republic of Mari El, the Udmurt Republic, and the Republic of Mordovia. In financial terms, in 2017 the volume of innovative

goods, works, and services of cultural enterprises amounted to 22.2 billion rubles, of which 14.9 billion rubles were accounted for livestock and 6.5 billion rubles for crop production. The share of innovative products in the total volume of goods shipped and work performed in the agri-food complex was 1.4% (in industrial production - 8.4%).

Table 5. The share of the number of developed advanced production technologies per employee engaged in research and development in the Volga Federal District of the Russian Federation for 2005-2016

Region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Republic of Bashkortostan	0.001	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Mari El Republic	0.000	0.002	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.011
The Republic of Mordovia	0.010	0.014	0.009	0.004	0.002	0.009	0.008	0.007	0.005	0.006	0.010	0.008
Republic of Tatarstan	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.003	0.002	0.003	0.005	0.005
Udmurtia	0.001	0.001	0.001	0.001	0.003	0.002	0.003	0.011	0.013	0.011	0.014	0.010
Chuvash Republic	0.000	0.000	0.007	0.006	0.007	0.008	0.004	0.005	0.002	0.004	0.002	0.003
Perm region	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.002	0.001	0.002	0.002	0.003
Kirov region	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nizhny Novgorod Region	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.001
Orenburg region	0.000	0.002	0.002	0.006	0.001	0.005	0.000	0.002	0.003	0.001	0.000	0.001
Penza region	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.004	0.006	0.006	0.002	0.000
Samara Region	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.003	0.002	0.003
Saratov region	0.001	0.002	0.003	0.004	0.002	0.003	0.003	0.005	0.004	0.004	0.002	0.002
Ulyanovsk region	0.000	0.001	0.001	0.000	0.001	0.001	0.002	0.004	0.005	0.004	0.000	0.006

Source: Rosstat data.

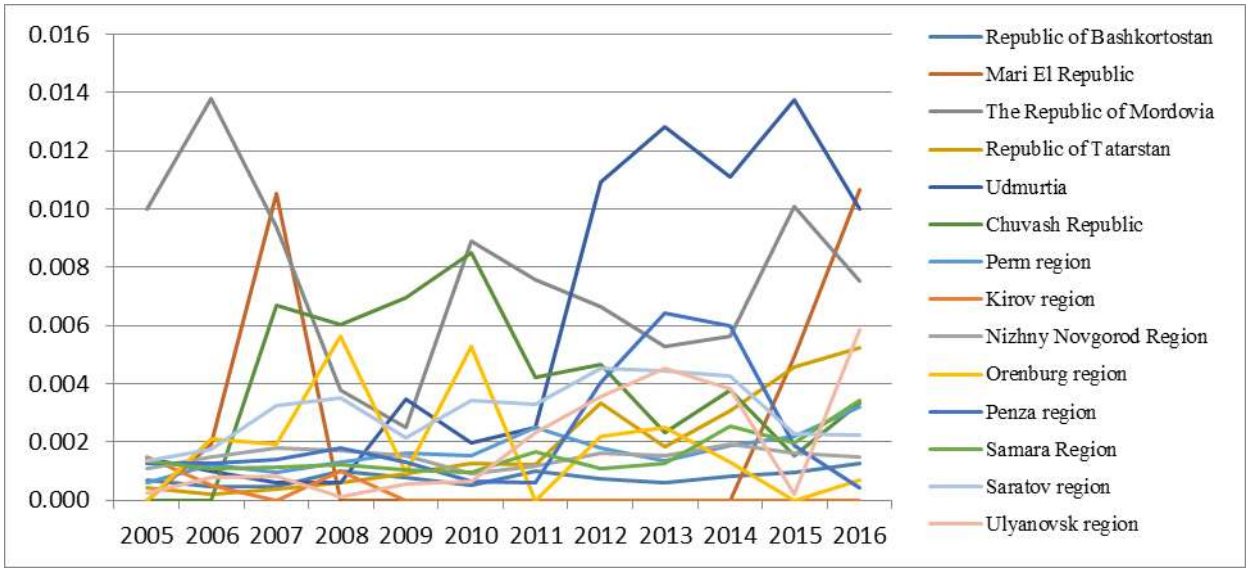

Fig. 5. Dynamics of the share of the number of developed advanced production technologies per employee engaged in research and development in the Volga Federal District of the Russian Federation for 2005-2016.
Source: Own determination.

This indicator differs significantly from statistics of European countries. In Europe, about one tenth of cultural production falls into the category of "innovation" (Spain -

12.7%; Denmark - 11.6%; the Netherlands - 9.2%). The cost of technological innovations in the cultural sector in 2017 was estimated at 15 billion rubles, their share in the total volume of products shipped was equal to 0.9% (Netherlands - 8.5%, Norway - 2.4%, Denmark - 1.9 %, Spain - 1.3%). In the cost structure of technological innovations, investments in the purchase of machinery and equipment dominate - 50.3%, another 17.7% go for engineering, 12.9% for research and development. As for the sources of financing, the innovation activity in the Russian agri-food complex is mainly implemented at the expense of the own funds of enterprises (59.3%), in second place are loans and borrowings (39%). The contribution of other sources is minimal: total budget support provides only 1.1% of the cost of technological innovations (including 0.5% from the federal budget, 0.6% from regional and local budgets), foreign investment - 0.5% [5]. One of the key factors of weak innovation activity in culture is the low level of transfer of innovations to production, when it is necessary to use not only new technology, but also scientific developments implemented in technological processes. In particular, about 60% of breeding achievements recorded by the State Varietal Commission are accounted for by Russian developments, the remaining 40% by foreign ones, Russian institutions and companies continue to register their breeding achievements, however, over the past few years, the share of Russian varieties has decreased. So, if in 2011, 77.4% of breeding achievements registered in the state register were Russian, then in 2016, there were 73.3%, and in 2017 - 71.7%. In the ranking of countries in terms of innovation (Global Innovation Index 2017), Russia was in 43rd place, rising five places compared to 2016. The first three places in the ranking are Switzerland, Sweden and the United Kingdom. In the United States, China, Germany, and other powerful economies of the world – there are hundreds and thousands of breeding companies. There are less than 20 breeding companies in Russia for which breeding is a business. For example, many cultural holdings buy innovative technologies abroad and do not want to invest in a national scientific school of development. Thus, the annual share of the cost of technological innovations in the Belgorod region does not exceed 1%. The exception is one of the largest Russian agroholdings, Agro TERRA, which in 2018 only tested 26 varieties and 9 crops in terms of efficiency under conditions of organic farming. These are cereals, legumes, flax and side rats. Also were tested 12 technologies of biological plant protection [1]. Another reason for the lack of innovative activity is the low level of remuneration of research workers and the problems of reproducing highly qualified personnel. In particular, the average monthly wage of education workers in the Belgorod region in 2017 was about 23 thousand rubles. Similar work, for example, in the countries of Eastern Europe (Czech Republic, Poland) is estimated at 1.5-2.5 thousand Euros, and in Germany 3.5 thousand Euros. The most important factor hindering innovation activity in the agrarian sector of the economy is the insufficient level of development of the system of state regulation of the processes of planning, creating and implementing innovations, in particular, grant support for scientific research. It is noteworthy that the existing grant system in Russia does not take into account the research organizations of the AIC at the appropriate level. In this case, due to the consequences of sanctions, Russia in the 2017 innovation rating was in 26th place below Poland, Malaysia and Italy. To a large extent, the narrowing of the degree of implementation of innovative projects in the cultural sector in recent years is due to the insufficient level of funding for research and development and practical development. An analysis of the sources of ensuring the innovation activity of business structures shows that innovations were financed mainly from their own sources, the share of which is about 52.9%, 1.0% from the state budget, 0.3% and 0.4, respectively. % domestic and foreign investments were attracted, 0.1% - funds from local budgets. One of the main reasons for the low level of use of the

innovation potential is the lack of financial support for the development and production of innovations, the imperfect structure of their sources and the mechanism for placing investments in scientific and technological development facilities. In this connection, an objective need arises to develop effective schemes for advancing and allocating financial resources in the agri-food sector, aimed at increasing innovation potential and enhancing the introduction of innovations of a diverse nature [15].

The strategic objective of the mechanism of innovative development of enterprises of the agri-food complex is the realization of scientific and intellectual potential both in the direction of the ability to realize existing opportunities for innovative development and in activating hidden opportunities that are not currently used. A critical review of the scientific literature made it possible to identify three methodological approaches that scientists identify when studying the nature and composition of the innovation potential: - resource - the availability and level of provision with appropriate types of resources for the implementation of innovative transformations; - diagnostic - the ability of resources constituting the innovative potential to achieve the set development goals; - effective - the ability of the resources of economic entities to create and implement innovations in activities and obtain the corresponding socio-economic effect. When forming a model for the implementation of the scientific and intellectual potential in the agri-food complex, it is advisable to explore the goals and principles, mechanisms, tools, competencies and motivation of the entities carrying out these processes (Fig. 6).

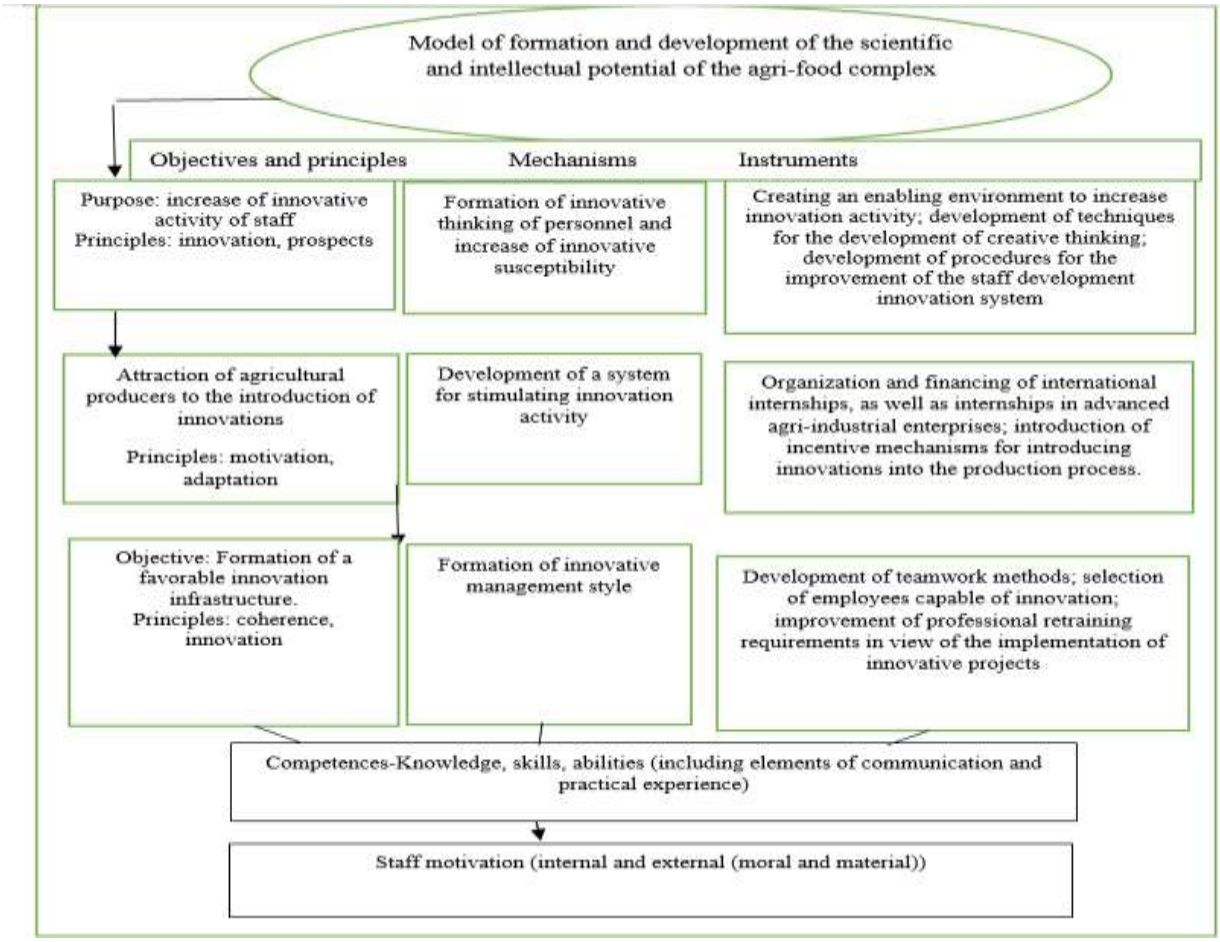

Fig.6. Model of formation and development of the scientific and intellectual potential of the agri-food complex
Source: Own determination.

The strategic goal of the implementation mechanism of the scientific and intellectual potential in the context of interaction with other components is to increase the level of competitiveness and increase the value potential of business structures, manifested in the final effective indicators of business value as an object of sale and purchase on the market [26].

As a result, the problem of developing and implementing strategies, methods, tools and practical measures for the implementation of innovation activities, which in the aggregate are implemented as part of the innovation development mechanism of enterprises, is becoming increasingly topical.

The study proposed a set of interrelated mechanisms for the implementation of the innovation scenario of the development of the agrarian economy of a region, allowing integrating the necessary functions of the individual components of the regional innovation subsystem and increasing the efficiency of its functioning:

(i)the mechanism for formation of technological platforms (creation of promising commercial technologies, new products and services; attracting additional resources for research and development based on the interrelated participation of business, science, the state, civil society); improvement of the regulatory framework in the field of scientific, technological and innovative development);

(ii)the mechanism for the implementation of the "innovation elevator" (coordination of innovation activities in the region; formation of the databases on promising innovation projects; organization of channels for the "transfer" of projects from one development institution to another; the "docking" of research and development with business);

(iii)the mechanism for adjusting federal and regional target programs (ensuring consistency and consistency of target programs at various levels; integrated use of measures and resources embedded in these programs);

4) the mechanism of formation and functioning of federal and regional development institutions (creation of conditions for the formation of the infrastructure of the regional innovation subsystem, providing access to enterprises operating in priority sectors of the economy to the necessary financial and information resources; creation and development of regional development institutions; organization of interaction between federal and regional development institutions) [22].

Table 6. The tasks of implementation of the mechanisms of the scientific and intellectual potential of the agri-food complex

Mechanism	Tasks for implementation of the mechanism
Mechanism for the formation of technological platforms	creation of promising commercial technologies, new products and services; attracting additional resources for research and development based on the interrelated participation of business, science, government, civil society); improvement of the regulatory framework in the field of scientific, technological and innovative development
Implementation mechanism "innovative elevator"	coordination of innovation activities in the region; the formation of databases for promising innovative projects; organization of channels for the "transfer" of projects from one development institution to another; "Docking" of research and development with business
Adjustment mechanism of federal and regional targeted programs	ensuring consistency and consistency of target programs at various levels; integrated use of measures and resources embedded in these programs
Mechanism of formation and functioning of federal and regional development institutions	creation of conditions for the formation of the infrastructure of the regional innovation subsystem, providing access to enterprises operating in priority sectors of the economy, to the necessary financial and information resources; creation and development of regional development institutions; organization of interaction between federal and regional development institutions

Source: Own determination

In the National Project "Science" a significant place is given to the innovative development of culture, including specific tasks for the creation of agri-bio-techno-parks and seed breeding, breeding centers and other research and production units (Table 6).

As a mechanism for transferring the results of scientific research, the calendar of events of the program provides by 2024 the formation of a set of measures for targeting government customers to the purchase of high-tech and innovative products created on the basis of Russian technologies. In the agri-food complex these are not only state bodies and enterprises, but also agri-industrial companies (cultural holdings) [7]. At the regional level, in our opinion, there should be Regional projects to promote the use of high-tech and innovative products within the regional product clusters and competitiveness programs provided by the national project "International Cooperation and Export", which can be used as a mechanism to support the development and transfer of innovations, and essentially form the network structures of horizontal innovation management.

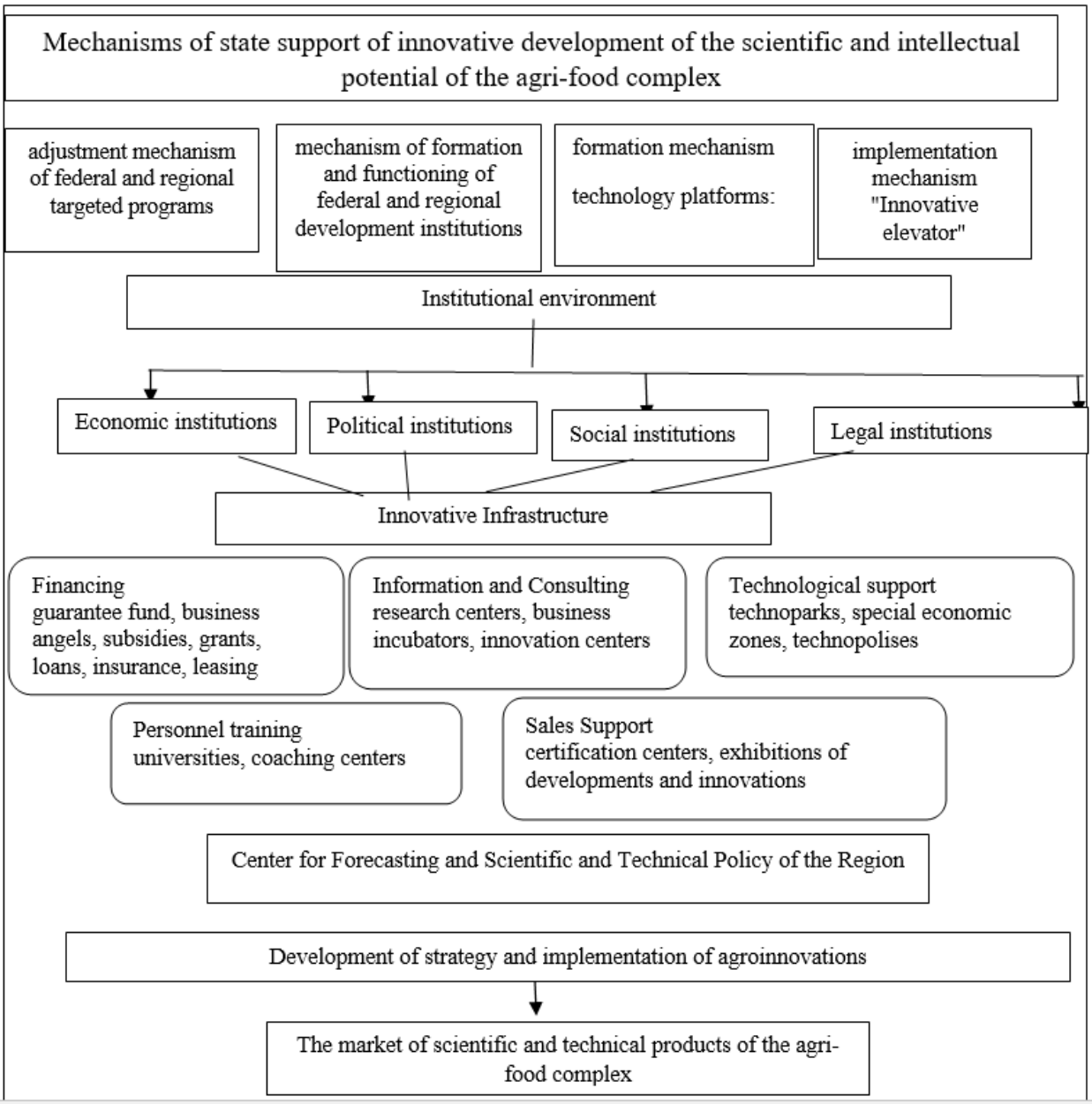

Fig.7. The mechanism for implementation of the priorities of the scientific and intellectual potential of the regional agri-food complex
Source: Own determination.

The paper substantiates the scientific and methodological foundations of formation of the mechanism for implementation of the scientific and intellectual potential of the agri-food complex subjects through the set of components of the innovation orientation of the development of agri-food formations, as well as the infrastructure of the innovation market, methods and principles for implementing the state innovation policy, tools for activating innovative transformations in the industry Fig.7.

CONCLUSIONS

The considered mechanisms of state support for the innovative development of the scientific and intellectual potential of the agri-food complex are implemented through the prism of the institutional environment and the innovation infrastructure of the regional agri-food complex. The Center for Forecasting and Scientific and Technical Policy of the region proposed for creation is called upon to carry out forecasting, strategic planning, programming, quoting, lending, subsidizing, leasing, legal regulation, monitoring, and formation of clusters. The activities of this Center, in our opinion, are aimed at overseeing the cultural organization for introducing innovations, organizing and conducting monitoring of the innovation infrastructure to track popular innovations, and concluding an agreement on cooperation for introducing innovations into cultural organizations. Cultural producers will have the opportunity to develop and implement innovations, since this Center will provide them with complete information on possible types of support and methods of their interaction with organizations of the innovation infrastructure. Innovative infrastructure gains access to all cultural organizations and farmers who need innovation of all forms. The state represented by the Center, by developing the innovation infrastructure, on the one hand, contributes to the activation of innovation in the cultural sector, and on the other hand, it ensures the demand for development and innovation, that is, it provokes the diffusion of innovations, establishes relations between the real economy and science.

These areas of work are implemented on the principles of public-private partnership through the formation of the state order with its support and further reimbursement of part of its value in accordance with the efficiency obtained from the introduction of innovations and scientific and technical products. The efficiency and effectiveness of innovation activities under the influence of the proposed mechanisms for managing the scientific and intellectual potential of the agri-food complex can be expressed in qualitative and quantitative characteristics. These criteria include: effective use of state support funds allocated for the implementation of national projects "Science" and "International Cooperation and Export" in the cultural sector of the constituent entities of the Russian Federation, the achievement of food production and export targets, the realization of the innovative potential of businesses, improving product competitiveness, and performance of economic entities of the cultural sector, the rising cost of business entities, ensuring food security of the country.

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INCLUSIVE DEVELOPMENT OF THE AGRI-FOOD SYSTEM AS A DRIVER FOR SUSTAINABLE GROWTH IN THE REGION'S ECONOMY

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Abstract

The article substantiates the need to change the paradigm of socio-economic development of the agri-food system, which will give new impetus to the steady growth of Russian territories. The priority of inclusive development, aimed not only at ensuring economic growth, but at solving social and environmental problems, strengthening the potential of both regions and the state is substantiated. It has been proved that as GDP growth slows down, a new source of economic development of the food and food market can be social, spatial, technological inclusion. The problems of the development of regional agri-food systems (spatial and social differentiation, technological complexity, inconsistency with the criteria of food safety) are identified. The possibilities of inclusive development of the agri-food system are shown: uniform and fair government support for all agricultural producers, employment growth and activation of the reproduction of the rural population, preservation of rural areas, solving environmental problems of depletion of natural capital and ecosystem exploitation.

Key words**:** *region, agri-food system, food security, sustainable growth, inclusive development*

INTRODUCTION

The modern development of the Russian economy is taking place in the context of numerous external economic and geopolitical challenges. The much-needed provision of economic growth is complicated by the many risks of technical-technological and socio-economic nature. These include the systemic crisis and the unsustainable post-crisis recovery of the national economy; decrease in real incomes of the population against the background of low rates of economic growth; high unemployment and poverty; the growth of social polarization and the leakage of creative strata of the population; financial sector instability and investment policy inefficiency; a serious backlog of the national innovation system; inefficiency of government institutions [11].

This actualizes the choice of the vector of modernization - from evolutionary to radical revolutionary.

The problems of sustainable economic growth are devoted to the activities of international organizations that continuously monitor its rates, sources, and the achievement of target parameters for sustainable development goals. FAO reports have repeatedly stressed the need to develop policies that address the interests of the poor and promote inclusive and sustainable agriculture, diversify income sources, create decent jobs, access to social protection and empower the rural population [13,27].

Inclusive development makes it possible to manage global risks: social, environmental, geopolitical [15]. The study of the relationship between inclusive growth and the digital transformation of the economy deserves attention. Digital technologies expand economic opportunities and open up new previously impossible paths [17].

The study of realities and the search for drivers of regional economic development is usually assumed within the framework of the well-known strategy of sustainable socio-economic development [8]. Sustainable development can be interpreted as a process that preserves the essential characteristics of

the territorial system and ensures the balance of social, economic and environmental processes. At present, the situation associated with economic growth in combination with depletion of natural capital and the degradation of ecosystems is unacceptable. And even the growth of the welfare of the population does not cause optimism against the background of the growth of environmental threats [4,12,28].

MATERIALS AND METHODS

The methodological basis of the study is the work of foreign and Russian economists in the field of research on the problems of agriculture and the agro-industrial complex, which have made a significant contribution to the scientific development of the problems of economic development of economic entities. At present, there is a need to search for new drivers of sustainable economic growth in order to strengthen the potential of self-development of territories and improve people's lives. Such a model of economic growth, which as a criterion is focused on the interests of the person, becomes relevant. It is from this point of view that economic, social, and political transformations in the life of the territory should be evaluated. This implies a transition to an inclusive model of regional socio-economic development, which not only ensures high rates of economic growth, but also draws into circulation all available resources, ensuring the development of institutions and technical-technological structures, as well as the comprehensive development of a person, regardless - economic situation [14, 18].

It follows that socio-economic development cannot be limited only by the sustainability parameter, but requires the addition of an inclusiveness parameter. At the same time, the importance of inclusive development increases with a slowdown in GDP growth rates.

The key concept in the inclusive development of the agri-food system is the concept of “inclusiveness”, the essence of which is described in the works of well-known modern economists Robinson and Acemoglu who use the terms - extractive and inclusive [1].

The methodology, based on evolutionary, institutional and logical approaches to the study of inclusive growth, allows to evaluate the interaction of extractive and inclusive institutions. Extractive economic institutions are characterized by a lack of law and order, difficulties in securing property rights, high barriers to entering business, over-regulation of markets, which are the most acute problems of the Russian agrarian economy.

Inclusive development (French inclusif - including, from the Latin. Include - conclude, include) is designed to minimize the negative effects of uneven international development and contribute to the movement of the state along the path of progress. In inclusive economies, property rights are protected, the functioning of the market is supported and regulated by state institutions. The opening of new businesses is simplified, but the incentives to execute contracts are strong. An important feature of inclusive economies is the access of the majority of the population to education and various types of activities. The use of these opportunities of the inclusive development model will make it possible to substantiate the strategic directions of the modern agri-food policy.

In accordance with the definition of the Organization for Economic Cooperation and Development, inclusive growth is interpreted as economic growth, creating opportunities for all segments of the population and more equitably distributing public goods, both monetary and non-monetary. The organization of economic cooperation and development within the framework of the concept of inclusivity proposed a whole system of such monetary and non-monetary characteristics: income and wealth, employment, professional skills and education, health, environmental quality, personal safety, infrastructure and housing conditions [6].

Since people are in the focus of inclusive development, the priority areas are social aspects, maintaining social harmony and stability, the innovative nature of economic growth, raising the material and cultural level

of all segments of the population. Inclusive development provides equal opportunities for the realization of human potential, regardless of socio-economic conditions, gender, place of residence and ethnic roots. It is the growth of incomes of the population, together with the growth of its economic opportunities, level of protection and quality of life, should be recognized by countries as the main goal of economic development.

Inclusive social development models create social harmony and stability, inclusive economic growth relies mainly on scientific and technological progress, increasing the material and cultural level of all segments of the population and the innovative nature of management work [9].

. The formation of this concept has become a kind of response of the developing world to the challenges, threats and achievements of globalization [7].

Models of inclusive development are promising not only for developing countries, they are actively used in economically developed countries. Such models are also relevant for Russia, which is looking for hidden reserves of economic growth. For developing countries, inclusive development is, first of all, the abandonment of the model of catch-up development based on imitation, copying, localization of external samples as the main motor of such a model [2].

It should be noted that the term "inclusive development" is widely used in economic, social and environmental aspects by many international organizations. The inclusive development of national economic systems is often considered in the context of the processes of disintegration of the global economy and finance, sanctions against a number of countries of the world, signs of the start of trade wars in global markets, etc.

Key indicators of inclusive economic development and the rating of countries on the inclusive development index were discussed at the World Economic Forum (WEF). The basic indicators of inclusive development include: growth and development; inclusion; justice and sustainability between generations. WEF calculates indicators from: GDP growth, labor force participation and life expectancy; average household income, poverty and two inequality measures; adjusted net savings (including natural depletion of capital and investment in human capital).

Analysis of various points of view revealed that researchers do not differ in the unity of views on the main provisions of the concept of inclusive development. At the macro level, inclusive development implies [5, 22].

- increase in the average standard of living of the population, growth in the average real income per capita;
- equal access of all segments of the population to public goods;
- reducing the degree of property stratification;
- reducing extreme poverty.

At the same time, a number of problems of inclusive growth at the meso and micro level still remain unresolved. This can be fully attributed to the issues of inclusive development of territorial agri-food systems. The transition to the inclusive growth model implies a shift in the priorities of the agri-food policy. To assess its effectiveness, measure the degree of growth inclusiveness.

The most important constraint for inclusive growth of the agrarian economy is unsustainable growth, and the uneven territorial distribution of opportunities (population, climatic and economic conditions). The elimination of restrictions on the path of sustainable economic development, which are an anti-incentive for potential entrepreneurs and investors, is a prerequisite for inclusive growth.

The recognition of the need for the inclusive nature of the sustainable development of regional agri-food systems requires a revision of the principles of sustainable development of the region. It is necessary to clarify the principles of the current stage of sustainable development of the region, taking into account compliance with the implementation of the inclusive development model, consistent with the global goals of sustainable development 2030 [16].

The concept of inclusive growth is a new economic model aimed at improving the well-

being of all segments of the population. The main purpose of inclusive growth is to expand human capabilities in order to include all members of society in socio-economic processes. To determine the degree of development of inclusive processes proposed key and institutional performance indicators [19].One of the key institutional indicators of inclusive development is also considered human capital and potential, the formation of which requires the presence of an educational system and a developed infrastructure, access to healthcare and to another, vital infrastructure [3].

RESULTS AND DISCUSSIONS

Sustainable growth of the regional economy is impossible without a corresponding development of the agri-food system, which is a complex subsystem of the economy, whose strategic goal is to ensure food security in the region [24].

The socio-economic importance of the functioning of the agri-food system is to provide the population with affordable and high-quality food in the required amount. Among the most important functions of the regional agri-food system are: economic, social, informational, innovative and environmental functions [29].

The agri-food system makes a significant contribution to the Russian economy: the share of agricultural products in GDP is close to 8%. At the same time, the share of people employed in agriculture is about 10%. It should be noted that over a quarter of Russia's population lives in rural areas (Table 1).

Table 1. Main indicators of the development of the agrofood system of the regions of the Russian Federation

Regions	Population per 1 km^2 of territory, people	Products of agriculture per capita, thousand rubles	Rural population ,%	Share of farmland in total area,%	The share of agricultural products in the GRP,%
Russian Federation	**8.6**	**34.8**	**25.70**	**13.00**	**7.95**
Central Federal District	60.3	33.1	17.90	51.20	5.72
Northwestern Federal District	8.2	16.1	15.70	4.00	3.22
Southern Federal District	36.7	54.3	37.60	75.30	20.10
North Caucasus Federal District	57.4	44.6	50.90	71.00	25.07
Volga Federal District	28.6	40.5	28.30	53.10	12.30
Ural federal district	6.8	25.9	18.80	9.00	3.45
Siberian Federal District	3.8	29.9	27.00	11.00	9.37
Far Eastern Federal District	1.0	26.4	24.30	1.30	4.57

Source: Rosstat data.

For the modern stage of development of the agri-food system, a whole range of problems is characteristic. First, the technological backwardness of this sector of the economy remains, which has led to a deterioration of the material and technical base, the degradation of agricultural land, a low level of labor productivity and labor skills, a critical dependence on imports of means of production, etc. Despite some positive trends, insufficient investment remains an unsolved problem. Secondly, the principle of equal conditions for multi-structured development of agriculture has been violated. Currently, large integrated structures receive the main state support, and small and medium agribusiness is almost cut off from it. Thirdly, the differentiation of the urban and rural population is significant in almost all parameters of social development (accessibility of social infrastructure, standard of living, employment, etc.). Fourth, the achievement of the target parameters of food security leads to the solution mainly of the task of food independence.

To assess the relevance of the trajectory of the inclusive development of the agri-food system, it is advisable to study the following structural components (growth and development, technological and social

inclusion, food security). Let us consider some indicators characterizing the degree of inclusiveness of the development of the agri-food system. The study revealed the main instability factors of the agri-food sector in the country: volatility of agricultural production (24% contribution to the reduction of physical accessibility of food), instability of agricultural policy (21.3% contribution) and corruption (36.5% contribution) [26].

Indeed, the themes of agricultural growth are characterized by high volatility due to the influence of natural and climatic factors [25]. There is a decrease in the share of gross agricultural output in GDP, labor productivity in the agricultural sector is lower than in the economy as a whole. The employment rate of agriculture has decreased in the last two years to 56%, while for the economy as a whole, this figure is 61% (Fig. 1).

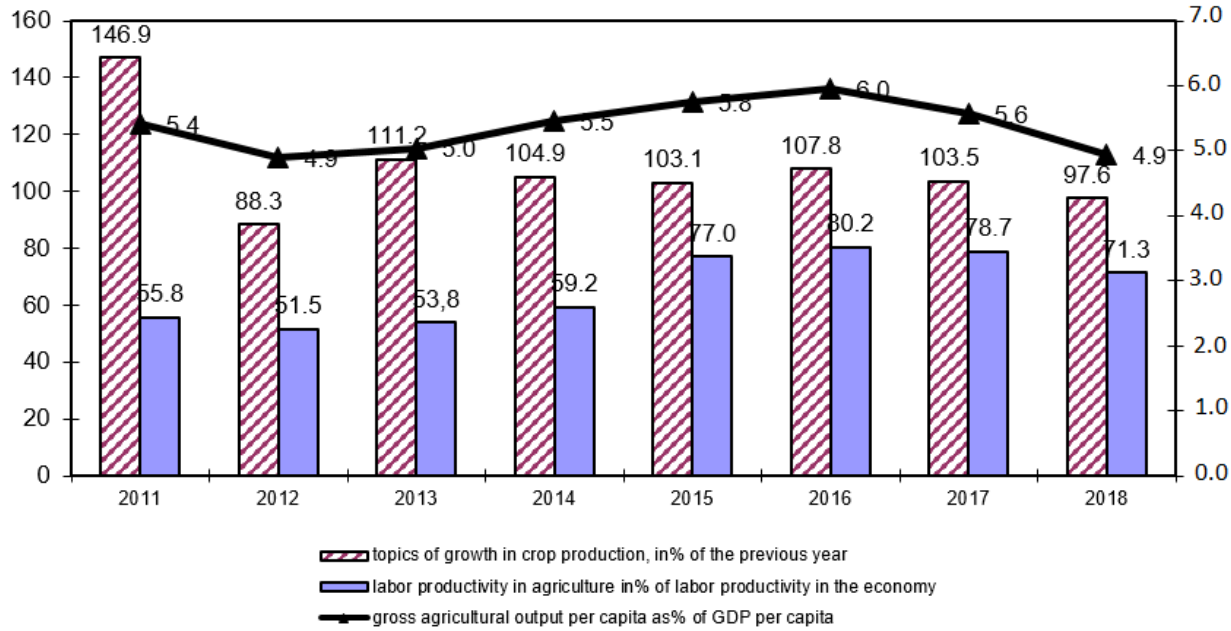

Fig. 1. Dynamics of indicators characterizing the development of agriculture in the Russian Federation

It should be noted the inequality of employment opportunities of the urban and rural population, which is reflected in the preservation of the gap in the level of their employment (Fig. 2).

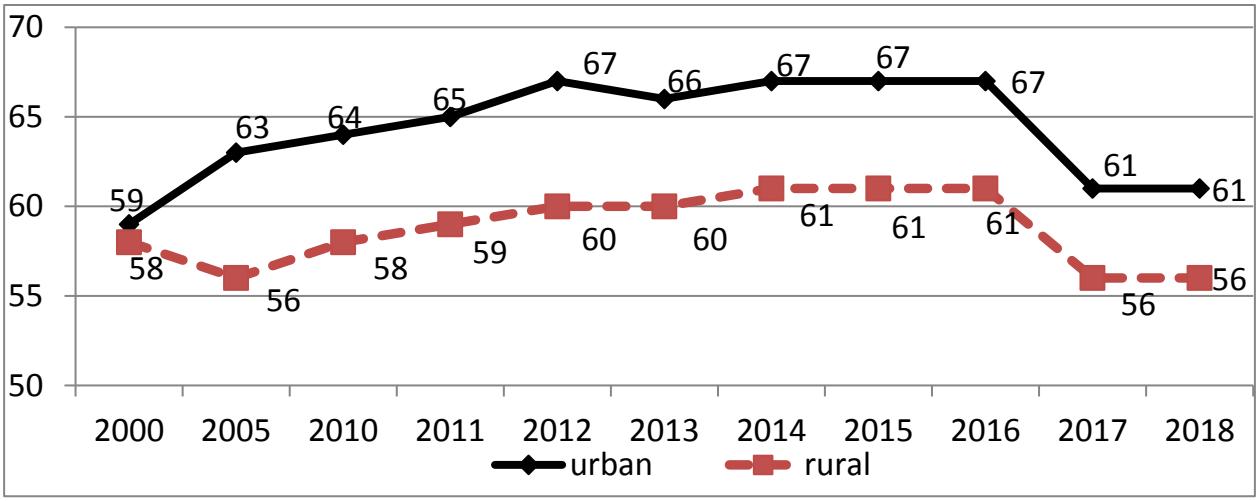

Fig. 2. Employment rate of urban and rural population aged 15-72 years, %
Source: Own determination.

At the same time, a double gap in the unemployment rate of the urban and rural population can be noted (Fig. 3). Increasing the employment of the rural population will allow the use of the concept of inclusive development.

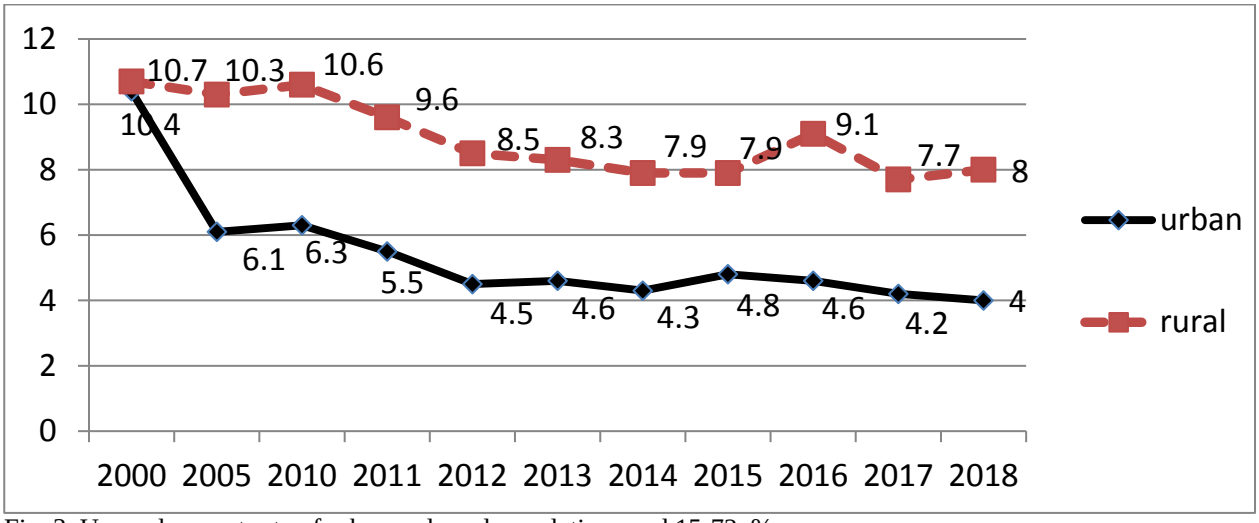

Fig. 3. Unemployment rate of urban and rural population aged 15-72, %
Source: Own determination.

The currently implemented model of socio-economic development still does not solve the social problems of the village. The differentiation of the standard of living of the urban and rural population is significant. The number of poor households living in rural areas makes up 52.2% of all poor households; the share of the population with incomes below the subsistence minimum in rural areas is more than three times higher than in the city. In 2017, the average monthly nominal accrued wages in agriculture accounted for 65% of the average for the economy, and the cash expenditures of households living in rural areas are a third less than those living in urban areas (Table 2).

Table 2. The average monthly nominal accrued wages and cash expenditures of households, depending on the place of residence in the Russian Federation in 2011-2017

	2011	2012	2013	2014	2015	2016	2017
Average monthly accrued nominal wage							
total economics, rub.	23,369	26,629	29,792	32,495	34,030	36,709	39,167
in agriculture, rub.	12,464	14,129	15,724	17,724	19,721	22,915	25,671
in agriculture,% of the average for the economy	53.34	53.06	52.78	54.54	57.95	62.42	65.54
Household cash expenses per month							
in urban areas, rub.	16,180.5	17,908.5	20,431.5	21,788.8	21,503.2	24,114.8	24,589.6
in rural areas, rub.	9,424.8	10,733.7	11,383.7	12,693.1	13,313	14,941.1	15,886.7
in rural areas,% of expenses in urban areas	58.25	59.94	55.72	58.26	61.91	61.96	64.61

Source: Own determination.

Household spending on food in urban areas amounted to 29.1% of all expenses in 2017, while living in rural areas was 32.8%, while rural residents were more dependent on food receipts from households (in urban areas, they account for 1.3% of all expenditures, in rural areas -7.3%).

Despite the implementation of state programs for the sustainable development of rural areas, problems with equal access of rural residents to social, in-road road infrastructure have not been resolved, this is especially true for the "rural hinterland".

One of the indicators of equal access to food for regional subsystems is the level of food independence. The analysis revealed a significant gap in the levels of self-sufficiency in basic foodstuffs in the subjects of the Russian Federation. Only six subjects of the Russian Federation (the Republic of Mordovia, Belgorod, Bryansk, Astrakhan, Kursk, Tambov regions) have the best indicators of food self-sufficiency. In 36 subjects of the Russian Federation, the self-sustainment potential is low and these subjects depend on external resources for filling the food market [10,20].

The regional differentiation of the physical availability of food is significant. Thus, in meat and meat products per capita consumption varies by constituent entities of the Russian Federation 2.61 times, for milk and dairy products - 3.38 times, for potatoes - 4.2 times, for vegetables - 7.69 times.

The energy value of food as an indicator of the quality of food also varies greatly in the subjects of the Russian Federation: the minimum value of this indicator is noted in the Khabarovsk Territory (2,146 kcal), and the maximum - in the Republic of Ingushetia (3,556 kcal). At the same time, the minimum proportion of animal products in the diet was recorded in the Kamchatka Krai (19.9%), and the maximum - in the Republic of Ingushetia (40.1%).

The characteristic of the economic affordability of food is the proportion of the cost of buying food in consumer expenditures of households. This figure differs more than twice by regions of the Russian Federation: from 29.3% in the Khabarovsk Territory to 61.8% in the Republic of Ingushetia.

One of the most important structural components of the inclusive development of the Russian food system is the technological component. Agriculture remains the sphere of the economy, poorly involved in technological development. In 2017, investments in information and communication technologies in the agricultural sector amounted to 3.6 billion rubles, which did not exceed 0.5% of investments in fixed assets. This is significantly inferior to the level of investment in other sectors and hinders the digitalization of the agri-food system. This represents a visible barrier to the modernization of the Russian agricultural and food system, which can be neutralized, provided that an inclusive development model is used.

CONCLUSIONS

Given the spatial and social differentiation of territorial agrofood systems, as well as their technological complexity, inclusive development can:

- to provide a more uniform and fair government support for all agricultural producers;
- increase employment and prevent the degradation of human capital in the countryside;
- intensify the reproduction of the rural population and preserve the rural territories;
- to overcome anti-sustainable trends of depletion of natural capital and the exploitation of ecosystems, as well as to solve the problems of greening production.

It should be noted that the inclusive development of the agri-food system should not be limited only to the autarkic model associated with almost complete food independence and self-sufficiency of the society [21,23].

Inclusive development does not exclude traditional sources of economic growth. The development of territorial agri-food systems should be based on increasing the productivity of labor, which is one of the sources for implementing the concept of inclusive development. At the same time, inclusive development is a multidimensional concept, involving a large number of participants in a mixed agrarian economy. Inclusive development transforms the model of economic development by optimizing and modernizing the economic structure, ensuring a coordinated solution of economic, social and environmental problems. Inclusive development relies on the involvement of all resources, contributes to the intensification of

investment and innovation processes. Considering that the peculiarity of the current stage of economic growth is the exhaustion of its capabilities, the potential of digitalization of the agri-food system of Russia as an engine for the inclusive development of the agricultural and food system, including the use of modern innovative digital business models and online platforms. The inclusive development model is a rejection of production growth at any cost. Inclusion will minimize the consequences of the uneven development of the agri-food system and provide hidden reserves for economic growth to achieve sustainable development goals.

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RESEARCH OF FACTORS OF COMPETITIVENESS OF ENTERPRISES OF THE AGRO-FOOD COMPLEX

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Abstract

The article discusses the methodological approaches to the analysis and evaluation of the competitiveness of agri-food enterprises and innovative products produced in it. Systematic and classified external and internal factors affecting competitiveness, conducted and their ranking.The presented factors are divided into internal and external. The dynamics of changes in the ratio of the influence of factors in each group using exponential weights is shown. A methodology has been developed for assessing the competitiveness of innovative products of the agri-food complex, developed using the balanced scorecard, which makes it possible to clarify the strategy for the further development of enterprises, detailing the necessary measures for its optimization. The proposed approach to assessing the competitiveness of both enterprises of the agri-food complex and products allows us to ensure internal consistency in the functioning of all actors and participants in the innovation process. The developed approaches will allow to increase the efficiency of managing the production of the demanded products and optimize the distribution of costs for the introduction of the most promising innovations of the agri-food complex in the sectoral and regional sections in accordance with the obtained results of the expert assessment.

Key words**:** *innovative development, agri-food complex, competitiveness, expert assessment, ranking, balanced scorecard*

INTRODUCTION

With the current globalization of the world economy, the level of export potential achieved determines the prospects for further economic growth of national economies. The tasks of creating an effective market for innovative products of regional agrosystems and creating effective mechanisms to stimulate demand for it, along with improving competitiveness and ensuring food security, are the most important on the way to innovative development.

Increasing the level of competitiveness is an important task for many agro-industrial enterprises of all countries [7]. The priority of this task and its relevance are associated with the globalization of the market and the steady growth of competition in the agri-food complex. Achieving the desired level of competitiveness contributes to the growth of business profitability and strengthening its position in the market.

In the current conditions of increasing globalization of the world economy, the achieved level of export potential determines the prospects for further economic growth of national economies.

The tasks of creating an effective market for innovative products in the agro-industrial complex and creating effective mechanisms to stimulate demand for it along with improving competitiveness and ensuring food security are priorities in improving the investment and innovation processes in the agro-food complex of the country [8].

The issues of assessing the level of competitiveness are reflected in the works of such scholars as J. Keynes, C. Marx, A. Marshall, J. Mill, A. Pigou, M. Porter, D. Ricardo, P. Samuelson A. Smith, R. Solow, S Fisher, F. Hayek, E. Chemberlin, J. Schumpeter et al. [15].Competitiveness as an economic category is investigated by experts in various sectors of the economy. M. Porter believes that competitiveness is a property of a product, service, a subject of market

relations, to act on the market on a par with the similar goods present there, services or competing subjects of market relations A. Barinov notes that the competitiveness of objects consists of the competitiveness of its elements and their organization and coordination to achieve the goal [2]. P. Zavyalov notes that competitiveness is the position of a commodity producer in the domestic and foreign markets, determined by economic, social, political factors, reflected through indicators (indicators) that adequately characterize such a state and its dynamics [16].

The current situation in the agro-food complex of countries dictates the need to adjust the methods for studying its competitiveness. Also deserves special attention the assessment of factors affecting the competitiveness of all subjects of the innovation process from the developer of the idea to the introduction of scientific development in the production process. [13].

MATERIALS AND METHODS

Foreign and Russian scientists are paying close attention to theoretical and methodological foundations that could serve as a basis for assessing the competitiveness of the enterprise. The economic literature discusses various methods, they are adapted to enterprises of various industries, including enterprises of the agri-food complex. Such methods include a differentiated method, a complex method, analytical and prognostic, graphical. The differential method for assessing the level of competitiveness of agri-food enterprises consists in comparing individual parameters of the analyzed company with reference or analog parameters of a highly efficient basic enterprise. The complex method is based on the use of mixed, group, integral indicators. The assessment of the level of competitiveness of the agri-food enterprise is also carried out by comparison with the base or reference enterprise. When applying this method, a complex or a generalized indicator is determined, which serves as an evaluation indicator. Analytical and prognostic methods allow to take into account various environmental factors and at the same time produce a comprehensive analysis of market conditions, technology and products [14].They also include the use of an enterprise valuation method based on sales level, market share, etc. Graphic methods, which include the pie chart method, the histogram method, the competitiveness polygon, allow to illustrate the position that an enterprise occupies when correlating it with its competitors [3]. In addition to the above methods, there are specialized methods, these include analytical methods. The composition of such methods includes those that allow to assess the competitiveness of the enterprise using an integral indicator. They are based on the use of market share, rating, assessment based on consumer value, assessment of the use of resources [6]. All these methods give a certain result and have the right to exist. The environment in which enterprises operate is complex and competitive, and therefore, to evaluate it, using only one method is not always rational.

To obtain a more accurate and unbiased assessment, it is necessary to combine existing methods. The combination of elements of analytical and graphical methods, and others, taking into account the advantages and disadvantages of each of them, will allow you to identify and show the real place of the enterprise in the competitive space.

Improving the methodology of research, analysis and evaluation of the level of competitiveness of the agri-food complex in our study is based on the use of an extended range of indicators and an increase in the degree of objectivity of the studied factors.

The study of the level of competitiveness is based on a complex of both external and internal factors affecting it. It is possible to influence internal factors of competitiveness of agri-food enterprises and products within the company, it is impossible to influence external factors.

Internal factors determining competitiveness can be managed [4]. The complex of internal factors influences the growth of competitiveness of agri-food enterprises.

According to the results of expert surveys at agrifood enterprises of the Saratov region of the Russian Federation, external and internal factors that accelerate and restrain competitiveness are systematized and classified.

The state of the material and technical base of the enterprise is determined by technological factors. In assessing the influence of the technological factor on the growth of competitiveness of an agri-food enterprise, capital intensity, labor intensity and labor productivity, the size and condition of fixed assets of the enterprise, raw materials reserves, and land productivity are taken into account [1].

Personnel factors determine the degree of formation of personnel policy of enterprises, level of the current state of affairs with the staff of the organization. Factors are assessed by indicators: the number of employees, the qualifications of specialists, the level of remuneration, the size of incentive payments, employee productivity, staff turnover, etc.

Financial factors determine the company's solvency for obligations and its financial capabilities. Financial factors are assessed by indicators: absolute liquidity, current liquidity, financial stability, solvency, etc.

Marketing factors determine the degree of efficiency of the marketing strategy, the implementation of the sales plan by the sales department and generating a planned amount of profit [11]. Marketing factors are assessed by such economic indicators as product price, sales, etc., as well as non-economic indicators: customer loyalty, effectiveness of measures to increase sales, the effectiveness of the sales department, etc.

Investment factors characterize an enterprise's ability to raise funds for development, including modernization, re-equipment, expansion of production, etc. The indicators for evaluating investment factors include: the presence of investors, financial stability, financial autonomy, funding, investment projects, payables, etc.

Information factors determine the information equipment of enterprises. Assessment of the factor is made on the basis of indicators: software of the production process, automated service programs, devices for accounting and control of work and rest schedules, etc.

Innovative factors determine the level of innovation activity of enterprises of the agri-food complex, the effectiveness of the implementation of innovation management strategies. Indicators for evaluating innovation factors: the innovation budget, the return on investment of innovations, the payback period of investments, the volume of renewal, etc.

Under the influence of organizational factors, the type of management structure of the agri-food enterprise is formed, the mission and goals are formed. To assess the impact of organizational factors on the competitiveness of enterprises and products, they apply indicators of the level of uninterrupted functioning of interaction processes in the production chain, the ratio of labor costs for managers and ordinary workers, performance indicators and work efficiency, the amount of costs for the maintenance of the management department.

Evaluation of factors of competitiveness of the enterprise is made on the basis of the developed pool of indicators by the method of ranking. Based on the expert evaluation, a diagram of factors of competitiveness of an agri-food complex enterprise of innovative type is proposed (Fig. 1).

As can be seen from the presented diagram (Fig. 1) of the evaluation results, the weighting factor of the innovation factor of competitiveness is of greater importance, relative to other factors. As a rule, in practice the situation is the same. This is due to the fact that competitiveness is determined by the ability of an enterprise to catch fluctuations and changes in the external environment, and in its main part - changes in the needs of potential customers, the emergence of a new market demand and transformation to these innovative changes [5].

Figures 2 and 3 show the dynamics of changes in the ratios of external and internal factors constraining the growth of competitiveness of enterprises actively introducing innovations, with the ranking of indicative weights of each of them according

to the results of expert surveys of heads of agri-food enterprises in the Saratov region of the Russian Federation for the period 2014-2018.

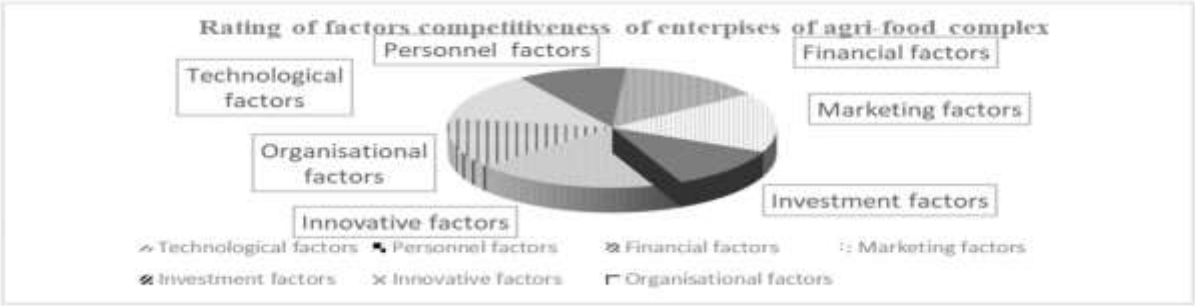

Fig. 1. Diagram of the results of the assessment of factors of competitiveness of enterprises of the agri-food complex
Source: Own determination.

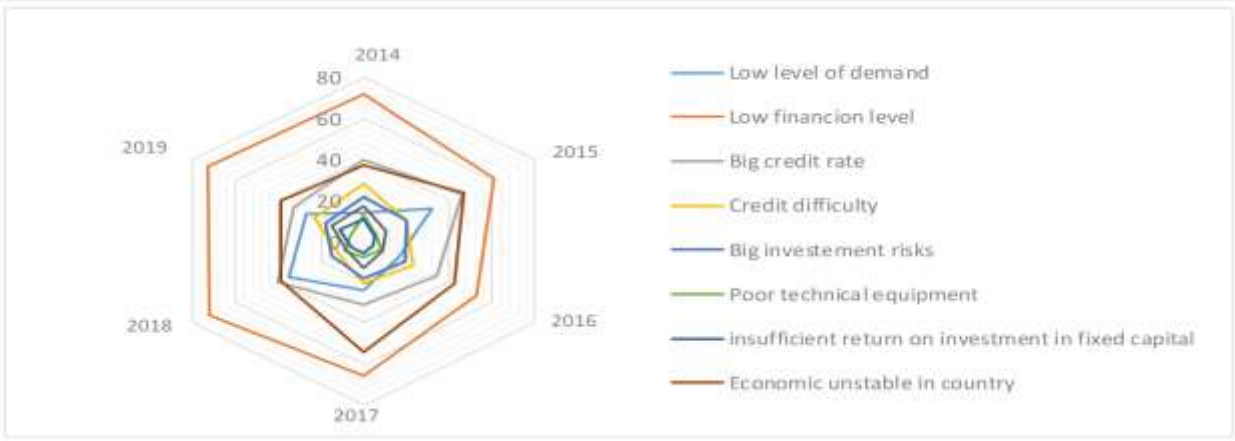

Fig.2. Dynamics of external factors that constrain the growth of competitiveness of agri-food enterprises in the Saratov region of the Russian Federation for the period 2014-2018.
Source: Own determination.

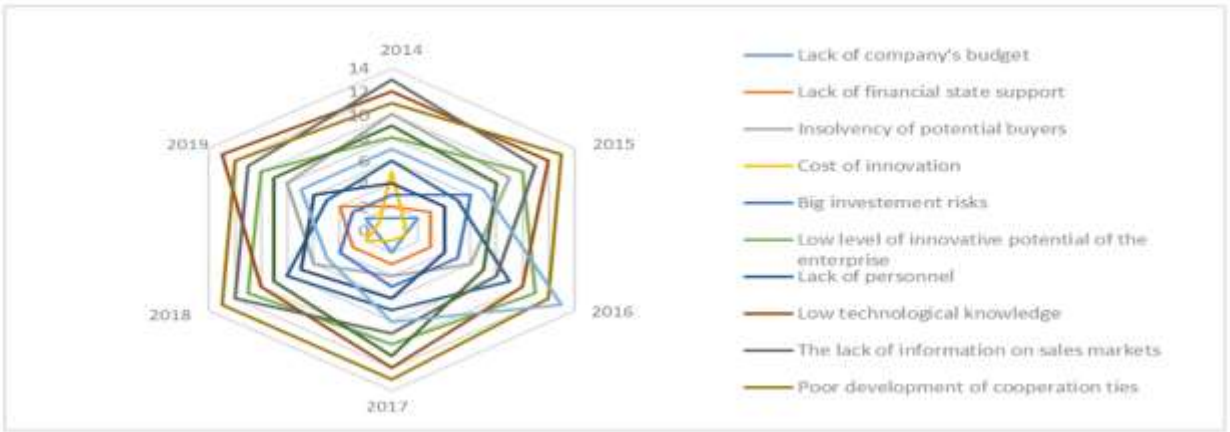

Fig. 3. Dynamics of Internal factors constraining the growth of competitiveness of agri-food enterprises in the Saratov region of the Russian Federation for the period 2014-2018.
Source: Own determination.

As it can be seen from Figure 2, the ratio in the influence of restraining external factors with time practically does not change. For the most part this is due to the conditions that have formed in the external, in relation to the enterprise, environment for which there are practically no opportunities for active influence [10]. At the same time throughout the period under review, the most negative factor affecting the level of competitiveness

of an enterprise is the lack of funding. In contrast to external factors, the ratio in the influence of internal factors (Fig. 3) turns out to be quite mobile, given the existence of a real possibility of their control and leverage [12]. Against this background, the most stable in terms of influence factors with significant weight coefficients were the poor development of cooperative ties and the availability of minimal information about technologies.

RESULTS AND DISCUSSIONS

Increasing the competitiveness of agri-food enterprises is inextricably linked to increasing the competitive advantages of products created using various types of innovations.
Among the factors of competitiveness of traditional products we highlight:
Price factor - pricing policy of the enterprise;
The production factor is the technical equipment of production, the technologies used, the raw materials; production time, organization and perfection of the production process;
Sales factor - the presence of sales channels, advertising budget, channels to attract new customers;
Service factor - the quality of service and work with clients;
Market factor - the level of competition in this market sector, market share, demand;
Marketing factor - brand recognition;
The quality factor is product certification, quality control work, warranty periods.
Thus, the competitiveness of agri-food enterprises and the products produced in them is determined on the basis of a complex of external and internal factors (Fig. 4).
The following steps can be distinguished in the implementation of the competitiveness management system of agro-food enterprises and the products manufactured in them: identification of issues that reduce the level of competitiveness; making appropriate management decisions; elimination of problem points; control of competitiveness; conducting innovative and marketing activities.

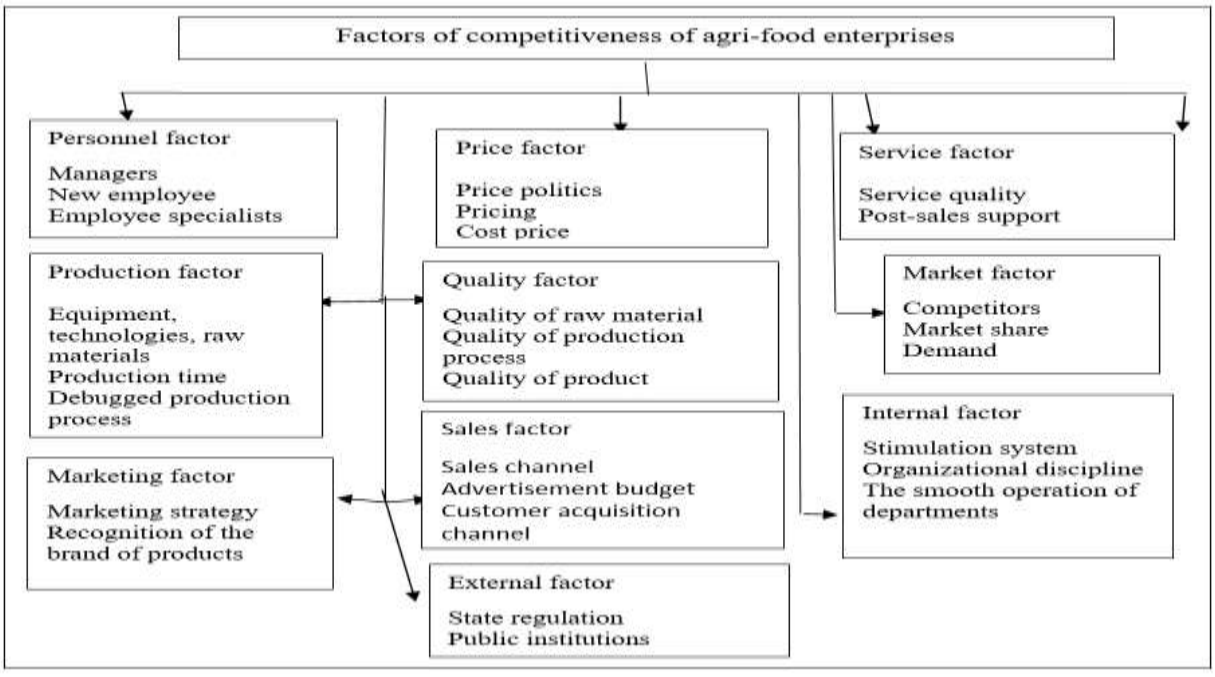

Fig. 4. Factors of competitiveness of agri-food enterprises
Source: Own determination.

Based on the study of factors of competitiveness, proposals for the development of methodological approaches to assessing the competitiveness of enterprises

and products [9] using a balanced scorecard based on the results of expert surveys are proposed (Table 1).

As a result of the application of this technique, the orderliness of the activities carried out is achieved, the internal consistency of functioning is ensured, the interests of all participants of the innovation process are taken into account.

Table 1. Balanced indicators characterizing the growth of competitiveness of enterprises of the agri-food complex

Innovative	Innovations of administrative device	Innovations of production process	Service innovations	Infrastructure innovations	Organizational innovations
1	0.20	0.20	0.15	0.15	0.15
Financial	Attracting new investments	Increase in profit	Optimizing costs, increasing productivity	Increasing the efficiency of the use of assets in innovation activities	-
1	0.25	0.30	0.29	0.16	-
Client's	Relations with clients	Qualified product characteristics	Business reputation	-	-
1	0.25	0.50	0.25	-	-
Personnel	Qualified personnel	Strategic planning	Motivation of employees, initiative	-	-
1	0.50	0.25	0.25	-	-
Processes	Strategy realization	Manufacturing process	Processes of interaction with customers	Processes of state regulation	-
1	0.45	0.30	0.16	0.10	-

Source: Own determination.

CONCLUSIONS

The proposed methodology includes a list of indicators that determine the innovative nature of management with assigning them a threshold value ranging from 1 to -1. As a summary of the data, weights are used.

The methodological approaches to assessing the competitiveness of agri-food enterprises and products presented in the work help to increase the efficiency of managing the production of marketable products and optimize the distribution of the costs of introducing the most promising innovations the industry and regional perspectives, and developing key strategies for the development of agri-food enterprises.

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THE MANAGEMENT OF FORESTS SITUATED ON FIELDS SUSCEPTIBLE TO LANDSLIDES AND EROSION FROM THE SOUTHERN CARPATHIANS

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Abstract

The forests with special protection functions from the Southern Carpathians play an extremely important ecologic role. Forests situated on fields with lithological substratum very vulnerable towards erosion and landslides are situated in this wide category of forests and are occupying even large areas. They are followed by forests situated on sliding fields. These two stand categories are analysed in the present article, starting from a large number of data regarding their component species, as well as their age, consistency and altitude at which they are present. Among the tree species, the common beech is the most prevalent, followed by Norway spruce and alder. The stands have an equilibrated distribution on ages, while the altitude does not influence their spreading. The main consistency is situated at 0.8, but forests situated on lands vulnerable to erosion and landslides can reach the 0.9 consistency category. Specific management measures were analysed as they were applied to these forest categories. As such, it was determined that management measures are specific to the conservation regime in stands that have a high intensity protection function, while they become specific to the forest's regime in forests where the protection's intensity is more reduced.
***Key words*:** *forest stands, landslides, Southern Carpathians, forest management plans*

INTRODUCTION

Soil humidity is a factor that can decisively influence soil productivity. However, in excess conditions, it can cause significant damages to fields from the mountain area. Due to this aspect, the monitoring of this parameter is extremely important [3], [8]. The soil humidity regime is influenced by rainfall, particle size distribution or other physical-chemical soil factors [5], [12]. Landslide is a phenomenon spread out in mountain areas [6], [14], [16], [17], [20], being also present in the Southern Carpathians [4].

Soil erosion is another phenomenon that affects soils from mountain areas [1], [7], [13], [15], [18], [21].

Soils from the Southern Carpathians are generally favourable to forest stands [9], [10], [11], but can lead in certain situation to the apparition of a negative phenomenon such as landslides and erosion.

Forests from this area are compiled of resinous species [19], mixtures of resinous and broad-leaved species and rarely of pure broad-leaved species.

MATERIALS AND METHODS

Forests from our country are grouped in two main categories (named functional groups), based on their functions: Group 1: Forests with special protection functions and Group 2: Forests with protection and production functions.

The first functional group is also divided in five sub-groups. Amongst them we can find the second sub-group entitled "Forests with soil and field protection functions" that includes twelve functional categories. Amongst them we mention: 1-2H category = "Forests situated on sliding lands" and 1-2L = "Forests situated on fields with substratum very vulnerable towards erosion and landslides". The purpose of this present article is to analyse the forests from the Southern Carpathians situated in these two functional categories.

The work material was represented by forest management plans from all the forest districts situated in the Southern Carpathians [2] from where were extracted the forests situated in

the 1-2H (345 stands) and 1-2L (15,412 stands) functional categories.
From the large database corresponding to these stands (approximately 20,000 stand elements), the following elements were extracted and analysed: occupied surfaces, species distribution, stand age and stand altitude. In addition, a synthesis of the proper management measures for these forests was also created.

RESULTS AND DISCUSSIONS

The distribution and characteristics of protection forests and field vulnerable to landslides and erosion from the Southern Carpathians

The forests that have an important soil protection function (namely the following categories: 1-2H= Forests situated on landslides; 1-2I= Forests situated on fields with permanent swamp formation, from ledges or inferior meadows; 1-2K= Forests situated on karst areas and 1-2L= Forests situated on fields with extremely vulnerable substratum towards erosion and landslides) occupy a surface of 60.320 ha. in the Southern Carpathians.

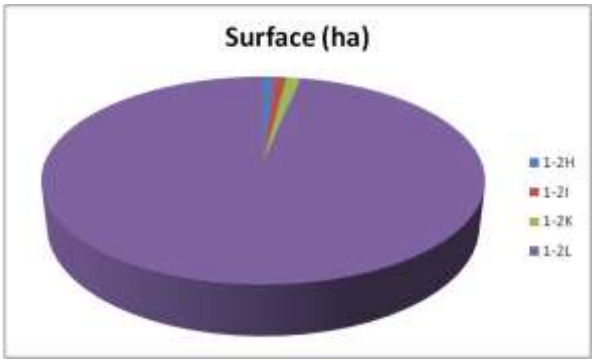

Fig. 1. Surfaces occupied by forests with soil protection functions from the Southern Carpathians
Source: original.

Amongst all the forests with soil protection functions from the Southern Carpathians, the ones situated on fields with extremely vulnerable substratum towards erosion and landslides occupy a significant percentage (97%), while the ones situated on landslide occupy only 1% (Fig. 1).

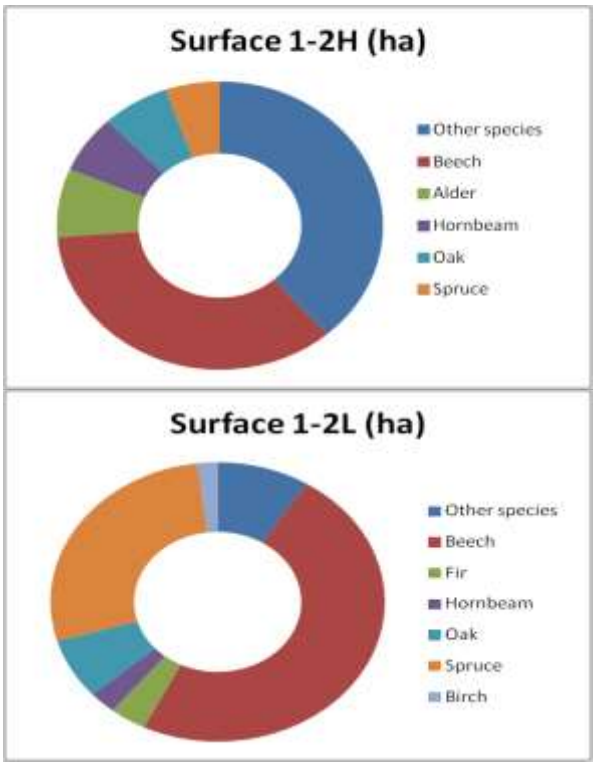

Fig. 2. Tree species from landslide fields (1-2H) and from vulnerable lithologic substratum (1-2L) from the Southern Carpathians.
Source: original.

Common beech (*Fagus sylvatica* L.) is the main species in both functional categories, while Norway spruce (*Picea abies* L., H. Karts.) occupies an important percentage in forests situated on vulnerable lithologic substratum fields (Fig. 2).
The low percentage of Norway sprue from landslides is caused by its root system that doesn't permit the stabilization of these fields. On the other hand, alder (*Alnus glutinosa* (L.) Gaertn.) is present on these fields, especially on mountain meadows or on newly formed fields where it installs easily.

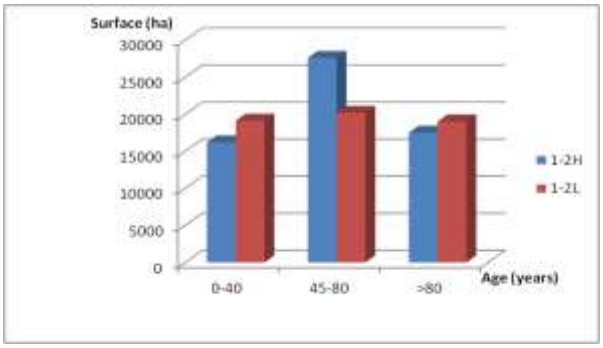

Fig. 3. Age distribution of stands from the 1-2H and 1-2L categories from the Southern Carpathians
Source: original.

In order to compare them, the surfaces occupied by forests from landslide fields were multiplied with 100 (Fig. 3). It can be seen that forests situated on fields with vulnerable lithologic substratum have a balanced distribution on ages, while forests situated on landslide fields are dominated by forests with an average age. The explanation consists in the fact that old forests have a volume and a height that are too heavy to be sustained by landslide fields.

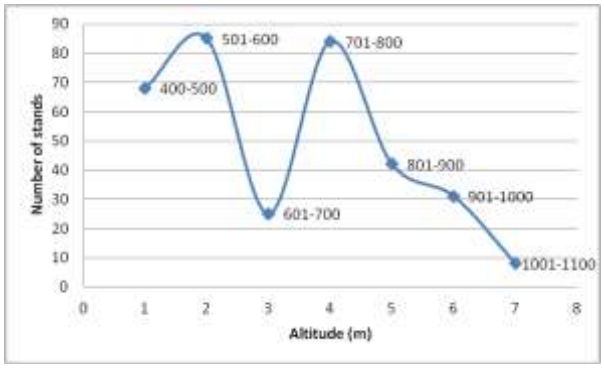

Fig. 4. Stand distribution on altitude for the 1-2H category from the Southern Carpathians
Source: original.

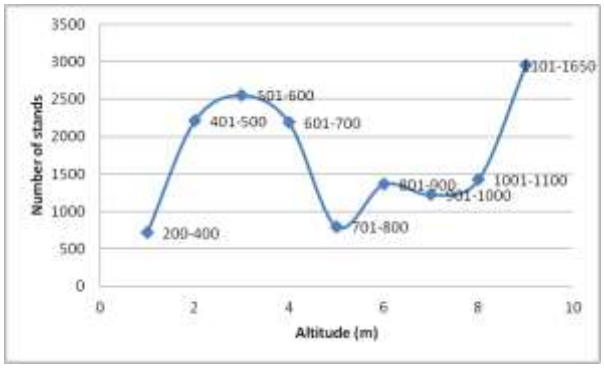

Fig. 5. Stand distribution on altitude for the 1-2L category from the Southern Carpathians
Source: original.

The distribution of stands on altitudes is irregular for both forests situated on landslide fields (Fig 4), as well as for fields with vulnerable lithologic substratum towards erosion and landslides (Fig. 5).

In regard with stand consistency, it can be seen that both functional categories register a consistency of 0.8 (fig 6, 7). However, forests situated on fields with very vulnerable lithologic substratum towards erosion and landslides (1-2L category) have a higher percentage for the 0.9 consistency.

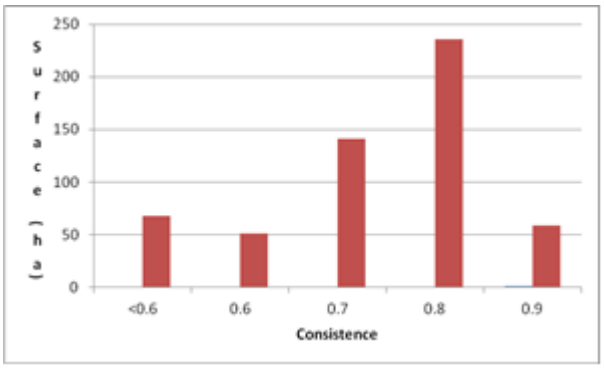

Fig. 6. Stand distribution on stand consistency for 1-2H category from the Southern Carpathians
Source: original.

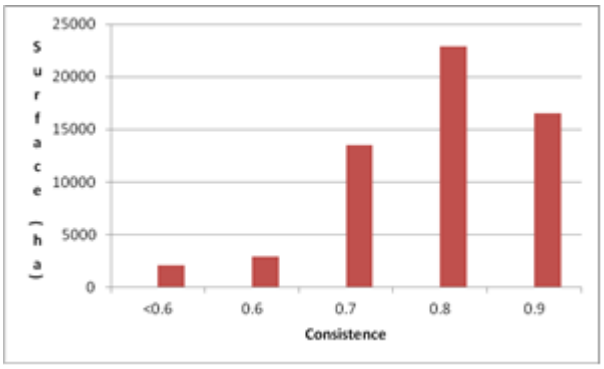

Fig. 7. Stand distribution on stand consistency for 1-2L category from the Southern Carpathians
Source: original.

Management measures regarding forests vulnerable to erosion and landslides

Forests that are vulnerable to landslides and erosion require a distinct system of management measures, based on the level of functional intensity assigned to each stand. As such, stands situated in the 1.2H and 1.2I functional categories fulfil high intensity protection functions (TII functional type) and are managed differently in M units – forests open to a distinct conservation regime. In this management unit, stands are lead towards optimal structures that can fulfil their assigned functions through conservation works. The structures that are intended to be realized in these stands are closely connected to the ones belonging to natural forests. They are obtained through conservation works in which the extraction of trees is reduced (up to 10%) and related to the stand's ecological and functional characteristics. In addition, the protection exploitability is adopted for stands with high intensity protection functions (TII),

without establishing protection exploitability ages.

Conservation works are provided for mature stands and are intended to maintain the forest and covered field so that the stand's protection effect will be maximum.

At the same time, the regeneration of stands is also taken into account as an objective, by creating regeneration nuclei. The new stands will assume over time the protection functions of the replaced stands.

In stands with low and average ages (un-exploitable and pre-exploitable stands) an entire system of maintenance works will be applied (release cuttings, cleanings, thinning, hygiene cuttings).

On the other hand, in stands situated in karst areas or on fields with very vulnerable lithologic substratum towards erosion and landslides, with slopes up to 35^0, the management measures are different than the ones applied for high intensity protection stands (TII). These stands fulfil both protection and production functions, being situated in management units in which the wood production process is regulated. In addition, the stands fulfil functions with lower intensity, being situated in the TIII (stands situated in karst areas) and TIV (stands situated on fields with very vulnerable lithologic substratum towards erosion and landslides) functional categories.

Even though the purpose in these stands is to obtain structures similar with natural stands, the means through which they are obtained differ. As such, stands are managed through intensive treatments (selection systems, quasi-selections and group shelterwood systems), based on the present stand structure, forest formation and field slope. They are lead up to the protection exploitability age, defined as the moment in which the average of the maximum protective stand effects decreases. Species with high anti-erosion and hydrologic value are used in regenerating stands as they are capable to vegetate in those site conditions.

In young and average-aged stands, the maintenance works are realized by taking into account the protection functions fulfilled. Tree consistency must not be reduced so that their protection capacity is not affected, a reason for which most of the works are prudent.

The possibility for main products established for stands with soil protection functions situated in TIII and TIV categories takes into account bypassing the adoption of high value possibility indicators that can affect these functions. In addition, in the case of management units with an excess of exploitable stands, the excess will not influence the level of possibility.

As such, applying treatments in these stands will be realized through wood exploitation technologies that will not affect soil and water quality.

CONCLUSIONS

The Southern Carpathians contain forests with soil protection functions. Amongst them, the ones situated on fields with very vulnerable lithologic substratum towards erosion and landslides are prevalent (97%). Even though they occupy a very small surface (1% of the total forests with soil protection functions), forest situated on landslides play an extremely important role in stopping this negative natural phenomenon.

Common beech is the main species for the two above-mentioned field categories, while the Norway spruce has a reduced presence on landslide fields due to its root system. The alder is also present on these fields due to its adaptability on newly formed lands with superior humidity.

Forests from all age categories are spread out in a balanced manner on fields with vulnerable lithologic substratum. On the other hand, old-age forests are not present on landslide fields due to their large mass that cannot be sustained by these fields. The altitude does not influence in any way the spreading of forests on the two functional categories.

Forest consistency for both categories is of 0.8, even though a high consistency can be found in forest situated on fields with very vulnerable lithologic substratum towards

erosion and landslides. This fact can be explained through the field's nature that suppresses intense silvicultural interventions in order to protect them (if the consistency is reduced, namely if some trees are eliminated, negative phenomenon can occur – landslides – cancelling the purpose for which this category was created).

The management of forests vulnerable towards landslides and erosion is different, taking into consideration the intensity level of protection functions assigned to each stand. As such, in stands with high intensity protection functions (situated in the TII functional category), the management measures are specific to the conservation regime and stands are sustained up to the age at which they can fulfil their assigned protection functions. The switch from one generation to the other is realized on a longer time period through conservation works.

In stands with a more reduced protection intensity (situated in the TIII and TIV categories), the management measures are specific to the forest regime and stands are lead up to their exploitation age in which intensive measures are applied in order to ensure an optimum growth of the structures that can ensure the protection of soils.

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PROSPECTS FOR IMPLEMENTING INNOVATIVE TECHNOLOGY IN ENTERPRISES WITHIN THE AGRO-INDUSTRIAL COMPLEX

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Abstract

The ability to ensure the competitiveness of enterprises within the agro-industrial complex is largely determined by their strategic orientation toward the conduct of innovation activity. Based on the findings from a theoretical analysis, this paper cites the need for implementing innovative technology as a major factor for boosts in the competitiveness of enterprises within the agro-industrial complex. The paper employs the findings from an expert survey to provide an insight into the current state of affairs with regard to the implementation of innovative technology in the Russian agricultural sector. The authors have analyzed some of the key characteristics of innovative agricultural technology. The paper describes some of the key issues in and prospects for implementing innovative agricultural technology in the agro-industrial sector. The authors have formulated a set of proposals aimed at enhancing the implementation of technological innovation in enterprises within the agro-industrial complex.

Key words**:** *innovation, innovation activity, innovative technology, innovation policy, enterprises within the agro-industrial complex*

INTRODUCTION

Innovations may be viewed as an economic category that reflects a collection of changes to technologies, certain processes, style of management, or HR policy, as well as methods for achieving this kind of changes that facilitate the implementation of innovations [2, p.23].

Innovations in the agro-industrial complex (hereinafter 'AIC') are normally the result of dynamic interaction among numerous agents engaged in the growing, processing, packaging, distributing, and consuming or further processing of agro-industrial output. Accordingly, these agents operate in various spheres, like metrology, safety standards, molecular genetics, intellectual property, resource economics, food chemistry, logistics, etc. To enable the emergence of innovations, interaction among these groups of persons must be open and predicated on the most relevant knowledge.

The findings from a study conducted by a group of researchers [9] provide convincing proof that agricultural enterprises' innovation activity is one of the most flexible indicators of their competitiveness. With that said, it has been noted that "the close interrelationship between innovativeness and competitiveness is characterized by naturally determined cyclic dynamics. A decline in a manufacturer's innovation activity may cause it to lose some of its positions in the market,

its production apparatus to quickly become outmoded, and the business to fall into a state of investment-technological and economic recession. On the contrary, galvanizing innovation activity facilitates the technical-technological refreshment of production and helps boost economic efficiency and competitiveness" [9]. It is worth noting that a key condition for galvanizing innovation activity is the creation of innovation programs focused on coordinating organizational issues and creating and implementing innovative products.

Based on projections by the United Nations, by 2050 the size of the planet's population will have reached 9.7 billion people, which may require significant boosts in production volume within the agricultural sector. It will be impossible to maintain such growth rates via extensive measures. Objectives of this magnitude require intensifying the development of both the technological and resource factors, which can be possible only through the implementation of innovations [3].

Scholars I.S. Sandu, V.G. Savenko, and Kh.N. Gasanova have cited the following among the key areas for implementing innovations in the AIC:

(i)ensuring the development and implementation of new technology in crop farming and livestock farming;

(ii)ensuring a better focus on refreshing the sector's technical-technological potential;

(iii)ensuring the training and retraining of professionals capable of making maximally effective use of machinery, equipment, and technology [7, p.32].

With that said, it may be noted that it is implementation of innovative technology that is becoming today a dominant form of innovation activity in AIC enterprises, which may require researching it more thoroughly within the setting of the agricultural sector specifically [4, p.9].

The authors suggest construing innovative technology in the AIC as a systematized composite of knowledge, information, and technological and organizational solutions which determine the way to carry out whole new and enhanced operations in the agricultural sector dealing both with the production and sale of agricultural output and with the conduct of management in the sector.

The study's purpose is to explore the current situation with and identify some of the prospects for implementing innovative technology in the Russian agricultural sector.

The study's hypothesis is as follows: determining the current situation with, the key benefits of employing, and the potential for adapting innovative agricultural technology in Russian conditions will help formulate a set of recommendations for the agricultural sector to help drive its progressive development.

The study's results attest that its objectives have been achieved.

MATERIALS AND METHODS

To achieve the study's objectives, the authors employed the expert survey method for the purpose of gaining a thematic insight into (and identifying some of the future prospects for) the implementation of innovative technology by enterprises within the AIC.

The authors' expert survey engaged members of the management team at 23 companies operating within the AIC (75 respondents in total). These experts were asked a set of questions relating to the quantitative and qualitative characteristics of the innovative technologies implemented in their enterprises over the last five years.

The field survey aimed to estimate the number of innovative projects implemented by agricultural enterprises over the past five years, the possibilities of using and the problems of adapting modern innovative technologies in crop production, as well as the latest technical and technological solutions in animal husbandry.

When processing the survey results, the introduced innovative technologies were divided into three groups based on the category of innovation: product-related, production-related, and organizational-managerial technologies. After this, according to the specified distribution, the share of each category of innovation and technology introduced in relation to the total number of

projects was calculated based on the following formula:
specific weight = (indicator of a separate column (category of innovation, type of innovative technologies) / total number of projects) * 100.

RESULTS AND DISCUSSIONS

The findings from the authors' survey of members of the management team at a group of enterprises within the AIC provided insight into some of the quantitative characteristics of innovative technologies (subject structure of innovative technologies) implemented by AIC enterprises over the last five years (the number of projects) (Table 1).

Table 1. Thematic Breakdown of Innovation Technologies Implemented by Enterprises within the AIC

Innovation category	Varieties of innovative technology	Number of projects	Relative share in total projects, %
Product-related	Ways to grow new (enhanced and modified) plant varieties	45	7.6
	Technology for growing productive and cost-effective livestock breeds	20	3.4
	Technology for growing ecofriendly products	9	1.5
	Total for the group	74	12.5
Production-related	Soil preparation technology	58	9.8
	Industrial technology related to arable farming and livestock farming	11	1.9
	Technology related to the use of fertilizers and crop protection agents	320	53.9
	Resource-saving technology	15	2.5
	Total for the group	404	68.1
Organizational-managerial	Production cooperation and integration	45	7.6
	Technology related to maintenance support and resource provision	40	6.7
	Technology related to organizing and motivating work	25	4.2
	Innovation-consulting systems	5	0.9
	Total for the group	115	19.4
Total		**593**	**593**

Source: Compiled by the authors based on the findings from an expert survey conducted by them.

An assessment of a set of vectors for the innovation-driven development of Russia's AIC enterprises indicates that the overwhelming majority of innovative technology implementation projects carried out over the last five years are accounted for by those dealing with production technology (68.1%), among which the greatest number of projects deal with implementing new methods for and ways of utilizing fertilizers and plant protection agents (53.9% of the total number of implemented projects). Significantly fewer innovations are related to new tillage technologies (9.8%). The introduction of resource-saving technologies and industrial technologies of agriculture and livestock has a small weight (2.5% and 1.9%, respectively).
Organizational and managerial innovations are in second place with a significant lag in specific weight in the total number of projects (19.4%). Among them, the leading innovations are related to production cooperation and integration, as well as technical maintenance and resource provision (7.6% and 6.7%, respectively).
Unfortunately, product innovations have the smallest share in the total number of projects (12.5%). These innovations are associated with the selection of new plant varieties and animal species and the cultivation of environmentally safe products (7.6%, 3.4% and 1.5%, respectively). This, in our opinion, together with production innovations, may be of the greatest interest in term of improving the efficiency of agricultural production.
Below is a detailed discussion of these product- and production-related innovations in crop farming and livestock farming in Russia.
As noted by the experts, most of the latest technical-technological solutions implemented in crop farming in Russia deal with selection work and genetic engineering, organic arable farming, micro-irrigation, space information technology, and nanotechnology (Table 2).
The most common way to boost crop farming production volumes today is implementing the achievements of selection work and genetic engineering. However, traditional selection requires significant time expenditure, significant cross-breeding effort, and vast selection material, so it is being supplanted by marker-based selection, whereby a focus on certain genes makes it possible to control them during the course of selection, which

helps ensure reliable and efficient selection procedures, while reducing the time it may take to create new varieties [6].

Table 2. Characteristics of the Use of Cutting-Edge Innovative Technology in Crop Farming

Potential for use	Adaptation issues
Selection	
– enhancing varieties' properties; – boosting crops' resistance to soil-climatic conditions and pests; – ensuring considerable increases in crop yield; – obtaining elite variety seeds	– lack of equipment; – lack of funding; – lack of technology for creating initial selection material
Genetic engineering	
– plants' resistance to yield loss, diseases, and pests; – improving the quality of produce and boosting crop yield; – boosting plant tolerance to herbicides; – enabling plants to produce pesticides of their own; – reducing the time it takes to maintain and process the produce; – ensuring savings on the costs of growing genetically modified organisms (GMO)	– lack of regulatory support; – toxicity of GMO products; – emergence of cancerogenic and mutagenic effects; – accumulation of herbicides; – declines in produce's nutritious properties; – harmful effect on human health – immune system suppression, allergic reactions, tissue mutations, etc.
Organic arable farming	
– eliminating the need for pesticides and fertilizers; – reducing the harmful impact of agricultural production on the environment; – dropping GMO	– lack of regulatory support; – lack of state subsidies; – produce certification issues; – lack of biological crop protection agents
Micro-irrigation	
– ensuring the optimum levels of crop water status in dry conditions; – ensuring the economic use of irrigation water, power, and fertilizers; – preventing soil erosion; – potential for reclaiming lands that are hardly suitable for crop cultivation; – potential for the concurrent conduct of agrotechnical works	– considerable irrigation-related construction costs; – lack of and scarce upgrades to sprinkling machinery; – high likelihood of sprinkler heads getting clogged and equipment getting damaged
IT technology	
– determining actual acreages; – forecasting crop yield and loss; – determining the level of use of material-technical resources; – potential for exposing unaccounted-for produce and resources	– need for considerable financial investment; – need for significant R&D effort; – need for a highly-skilled workforce
Nanotechnology	
– facilitating greater crop yield; – employing low-toxicity nanomaterials; – facilitating accelerated plant photosynthesis; – strengthening plants' protective properties	– lack of knowledge about the mode of action of nanotechnology and the characteristics of nanomaterials; – nanoproduct certification issues

Source: Compiled by the authors based on the findings from an expert survey conducted by them.

Of special popularity is technology related to genetic engineering and the use of genetically modified organisms (GMO). Methods of genetic engineering, cell biology, and DNA technology make it possible to transfer genetic material into plants from microorganisms, fungi, and animals. Extracting genes and incorporating them into the genome of existing plant varieties makes it possible to impart to them a set of new attributes, like resistance to pests and herbicides; tolerance to adverse soil-climatic conditions; ability to synthesize bio-pesticides; ability to neutralize toxic substances in soil and water; etc. [10]. However, researchers have yet to establish precisely these products' ultimate effect on living organisms which consume them – this effect may be felt for decades, affecting their life activity in adverse ways.

In this regard, many nations are exhibiting a growing interest in turning out agricultural eco-products, which are grown with a focus on minimum soil cultivation and giving up on the use of GMO and plant protection agents [1].

Organic agriculture implies giving up on the use of mineral fertilizers and pesticides, as well as stimulating soil's biological activity. The progressive development of Russia's agricultural sector has been impeded by various issues of a social, institutional-legal, and financial-economic nature, despite, as pointed out by some of the experts, an aspiration on the part of many of the domestic business entities to keep to the principles of organic arable farming in agricultural production.

According to one of the experts, "today the development of arable farming tends to be characterized by a focus on creating the conditions for sustainable management of soil's condition. In this respect, a key focus is on land irrigation and drainage, which may help minimize the dependence of agricultural production on the conditions of natural moisture supply".

However, as noted by some of the experts, due to insufficient government support for land improvement programs, the use of

outmoded irrigation systems, and the high costs of installing the latest irrigation machinery there currently are no plans to implement micro-irrigation systems widely in enterprises within the AIC.

Table 3. The Latest Technical-Technological Solutions in Livestock Farming

Potential for use	Adaptation issues
Biotechnology	
– preserving the livestock gene pool; – improving livestock health; – enhancing the quality of livestock farming products; – improving livestock productivity using selective breeding methods	– need to conduct R&D and engage highly skilled personnel; – emergence of undesired mutations; – reduced reproductive capacity; – infection transmission risk
Selection-and-breeding work	
– enhancing existing and creating new livestock breeds (hybrids); – improving livestock's productive features; – utilizing the genetic potential of the best breeds	– poor development of selection-and-breeding work; – need to attract financial resources; – need to prepare research personnel
Feeding systems	
– ensuring the effective use of various feeding modes; – reducing feed loss; – ensuring continuous access to feed using a state-of-the-art feed supply system; – increasing liveweight gain; – ensuring the accuracy of portioning and dispensing the feed	– need to attract investment; – need for skilled personnel capable of managing the feeding process; – feed dispensation process being highly automated; – significant financial costs
Technical-technological support	
– improving the conditions in which livestock is raised; – improving working conditions; – reducing the costs of producing a unit of output; – improving the quality of livestock output; – ensuring the economic use of resources	– high equipment upgrade and modernization costs; – need to import cutting-edge livestock maintenance and feeding technology; – need to improve the characteristics of materials used for equipment
Resource-saving technology	
– reducing capital expenditure and production costs; – ensuring the specialization of works related to raising and keeping livestock; – boosting livestock's reproductive capacity; – ensuring the effective organization of livestock rest and feed activities; – ensuring the effective use of waste transportation and disposal systems	– need for state support and incentivization; – need to attract investment in order to reequip livestock farming complexes and poultry farms; – implementation of mechanisms for automating and computerizing the production process; – use of robotics; – need to retrain personnel

Source: Compiled by the authors based on the findings from an expert survey conducted by them.

Employing the achievements of the space industry is becoming one of the most expedient ways of amplifying the development of agricultural production. This is quite relevant in present-day conditions, since, as per the experts, the use of vast areas for agricultural purposes suggests the need to continually stay updated on the current situation with resources, ensure the effective use of natural-resource potential and material-technical resources, forecast crop yield, and implement the latest land-use systems and information agritechnology, which may require developing and implementing relevant innovative information technology.

Scientific-technical progress has also provided a major impetus for the development of nanotechnology, which, in the view of one of the experts, is "present in all spheres of agriculture, including machinery and fertilizer systems".

Another sector within agriculture that is stimulating business entities to modernize, get equipped better technologically, and produce cutting-edge technical solutions is livestock farming (Table 3).

The key areas for implementing innovative technologies in livestock farming include the following [5] (also see Table 3):

-biotechnology (employing methods of cell biology and genetic engineering to boost the animals' reproductive function). The findings from research are used to improve the animals' health, enhance the quality of livestock farming output, better protect the environment, and preserve the gene pool. Biotechnologies make it possible to identify animals that are genetically resistant to various diseases and utilize them as part of the selection process;

-selection-and-breeding work (aimed at enhancing the animals' breed qualities via the intensive use of highly productive pedigreed breeders). The efficiency of breeding work is closely associated with the focus on reproduction, main herd refreshment rates, the ability to provide high-quality genetic material, and the capacity to have in place a domestic market for breeding resources that, going forward, will fully accommodate the national need and be export-oriented;

-feeding systems. The latest feeding standards must factor in the animals' need for energy,

dry solids, proteins, carbohydrates, fiber, fat, microelements, carotene, vitamins, etc. [8]. This implies designing different feeding modes to fit the needs of particular breeds to ensure accurate portioning. This technology helps increase liveweight gain. However, as noted by the experts, the implementation of intensive feeding systems is impeded by the need for significant funding, which is required to modernize and automate the production processes;

-technical-technological support, which implies upgrades to the technological base of AIC enterprises via the installation of the latest equipment for keeping livestock, e.g. latched or nonlatched fences for pens and feed tables; combined pens; common watering points; stall arrangements; feed dispensation and distribution systems; cutting-edge milking machinery etc.;

-resource-saving technologies, which imply an orientation toward the implementation of fully automated processes, the use of robotics, the creation of a sustainable feed base, and the raising of high-yielding livestock. A proper focus on this should have a positive effect on profit margins within the livestock farming sector and provide a basis for the innovation-driven development of the agricultural sector.

On the whole, in implementing innovative technology, AIC enterprises may need to be guided by the following approaches: identifying a set of priority areas that require an innovation-focused approach; reducing the number of management levels with a view to speeding up innovation processes; optimizing the timeframes for working out and rationalizing innovative projects.

Along with a set of positive features that an enterprise acquires in the course of implementing innovative projects, there are also certain negative considerations that may hinder making effective managerial decisions, namely:

-increased levels of uncertainty regarding the end result with respect to timeframes, expenditure, return on investment, or product or service quality, which may require amplifying the risk management function in innovation management;

-increased levels of risk, which may require searching for a good investor;

-accumulation of various issues, resolving which may require making a set of organizational changes in the company.

CONCLUSIONS

Summarizing the above makes it possible to draw the conclusion that implementing innovative technology is a key objective for any enterprise, being a promising area for development which helps create a favorable environment for the effective use of the company's resource potential and stewardship of its competitiveness.

It may be worth viewing innovation-driven development in enterprises within the AIC as a systematized composite of knowledge, information, technological and organizational solutions, quantitative and qualitative changes in productive forces, economic relationships, and the outcomes of companies' business activity based on the implementation of innovations, strategies for innovation-driven development in companies aimed at fostering sustainable development, a set of targets for the company's development based on the implementation of innovations, methods and key activities for the conduct of innovation activity, and mechanisms for fostering a company's openness to and aspiration to continually generate, implement, and realize innovations.

Thus, the use of innovative technology in the agricultural sector helps ensure the progressive development of agriculture, facilitate the attraction of investment, and bolster economic and technological security. However, market conditions in the sector are changing, with new technology continually coming out which may require further research and in-depth substantiation.

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GLOBALIZATION AND TOURISM. CASE STUDY - ROMANIA

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Abstract

The term globalization is one that is increasingly used in all areas. But studies show that when it comes to tourism, globalization is the element that has most influenced the development of this sector. Through tourism, there is the possibility of recreation, sports, rehabilitation, business, religious, scientific and intellectual: new experiences, perceptions and knowledge. In this way, modern tourism becomes a mass tourist. In this paper we intend to analyze how globalization, the advantages offered by it have influenced the arrivals and departures of tourists in Romania, but also beyond its borders, in the period 2014-2018. The research methodology was based on the study of the bibliographic sources and on the use of the information provided by the statistical data, data that have been processed, analyzed and interpreted in order to highlight the way tourism has evolved during these years.

Key words**:** *globalization, tourisme, economic development*

INTRODUCTION

In the tourism sector, the phenomenon of globalization has caused many changes such as: organizing the logistics necessary for transport on regional or even global structures, defining international rules of conduct, developing and specializing different forms of tourism, turning some areas into a tourist destination only after the penetration of some structures global tourism professionals in that region [3].

Globalization in the tourism industry has been influenced by the development of technology because simplifying travel, increasing its security has helped to increase the number of tourists both in domestic and international tourism and has also contributed to the unification of tourism services and improving their quality. Another important element favored by globalization is e-commerce that the travel industry changes the structure of distribution and distribution of tourism products, eliminating the existence of distribution networks such as tour operators, travel agencies, etc.

Also, the standardization of tourism products and services are elements that favor the use of global marketing and the promotion of tourist destinations [3]. Moreover, globalization has led to the application of unified rules and standards for the purpose of serving tourists, as well as to the development of tourism infrastructure. Increased demand for tourism has helped to increase competition in this sector and to the emergence of international players in the tourism and hotel industry that use the latest technology in the hotel booking system, using the fastest and most comfortable means of transport, in the sale of tourist packages, which ultimately leads to the globalization of tourism and the integrated development of each country participating in this process. In the global economy, tourism contributes to the accumulation, movement and concentration of capital, important elements for economic development.

However, globalization also has many disadvantages, the most important of which are: the strategic nature that implies the impact on the future of civilization; the conditionality of factors that are difficult to control, such as technical, economic, social, natural ones; the amplitude that refers to most of the planet's population; urgency, which refers to the need to take rapid action on

hunger, refugees, environmental protection, demography, etc.; the close interconnection of certain areas, solving demographic problems can lead to the reduction of hunger, the use of modern technologies can contribute to solving the problems of health or environmental protection, etc.

And yet, globalization and associated technological change will transform our lives with unprecedented speed [8].

Tourism influences both the trade balance and the balance of payments of a country. It can generate both imports and exports. Receiving tourism generating revenue from non-residents visiting the country has a positive effect on the two types of balance, while emitting tourism, which generates spending by residents visiting other countries, has a negative effect on these balances. But receiving tourism can also generate a series of imports that are reflected in spending by travel agencies for goods purchases outside the country to be used in domestic tourism. Emitting tourism can also generate revenue-generating exports, such as income earned by the home country from the sale of goods used in tourism by other countries.

Tourism has both direct and indirect effects on a country's economy. Thus, the direct effects are represented by the creation of new jobs, which will increase the income of the population, increase the social contributions to the state budget, increase the revenues of the tourism organizations, as well as for other categories of traders. Indirect effects are cascade revenue generated by tourism activities.

Some specialists consider tourism to be a saving solution designed to support the economic development of a country and implicitly increase its standard of living [2]. Other authors show this is a mistake, because a "healthy" economy can not only depend on an economic sector. Countries that depend exclusively on tourism are considered fragile environments because any external event that negatively affects tourism can have devastating effects on them. Often, the short-term impact can be positive and long-term negative. At other times, although the impact is positive at first, a deeper analysis shows that things are not so, for example, even if tourism leads to new jobs, most of the time it is about labor seasonal and poorly paid [5].

However, tourism remains an important activity in the economies of countries around the world, and this can be demonstrated on the basis of figures derived from published statistical data. The present paper aims to analyze how tourism activities can influence the economic development of Romania

MATERIALS AND METHODS

The methods of scientific research were represented by the bibliographic synthesis for the theoretical foundation of the work, and for the case study, we collected data from the specialized institutions, reports and statistics, their processing, comparative analysis and their interpretation. All these have been used to demonstrate the role that tourism has in creating revenues and economic development of Romania.

RESULTS AND DISCUSSIONS

Analyzing the situation of arrivals and departures in Romania we find that arrivals of foreign visitors to Romania increased during the analyzed period.

Thus, over 8 million visitors in 2014 reached almost 12 million visitors in 2018. Taking the base year 2014, the increase in the number of foreign tourists visiting Romania was 10.5% in 2015, 21.1% in 2016, 50.5% in 2017 and 38.8% in 2018.

This is precisely because of the phenomenon of globalization, the fact that Romania has been promoted and the confidence in making the trips performed in our country has increased.

The same thing happened regarding the departure of Romanian tourists abroad. With the increase in income, the Romans began to allocate higher amounts to vacations. So if in 2014 the number of departures was about 12 million, in 2018 it was over 21 million. Taking the basis for 2014, we find that the number of foreign arrivals increased by 6.6%

in 2015, by 31.1% in 2016, by 62.1% in 2017 and by 71.1% in 2018.

Table 1. Arrivals of foreign visitors in Romania and departures of Romanian visitors abroad (Number)

	2014	2015	2016	2017	2018
Total arrivals	8,441,603	9,331,056	10,222,889	12,706,133	11,720,425
Total departures	12,298,995	13,118,077	16,127,997	19,939,664	21,038,806

Source: own processing, Romania's Tourism Roundup.

With the increase in the number of tourists, we also tracked their distribution according to the reason for the trip, finding that all three travel motives had the same trajectory, ie a relatively constant evolution in the analyzed period, with a decrease of 10% in 2016 as compared to 2014 and recording 8% fewer halters this year compared to 2018.
The decrease in 2016 was 10% compared to 2014 and 13% for holiday travel, with other motivations such as treatment or pilgrimage and 1% motivating business. Compared to the previous year, however, the decrease in the number of nights for business tourism was 18% (Table 2).

Table 2. Overnight stays, by main reason of the trip

	2014	2015	2016	2017	2018
Total - of which:	**75,075,604**	**76277379**	**67,651,428**	**73,520,974**	**7,3876,673**
Holidays	65,862,170	65,187,368	59,338,558	63,695,620	64,465,302
Business and professional reasons	2,438,458	2,969,407	2,422,994	2,972,714	2,591,477
Other reasons (treatment, pilgrimage)	6,774,976	8,120,604	5,889,876	6,852,640	6,819,894

Source: own processing, Romania's Tourism Roundup.

If we analyze the number of travels made abroad by Romanian tourists according to destination, we find that European and EU countries have the greatest attractiveness among tourists considering the location that creates the advantage of affordable, less expensive, and the Eurozone.
North American tourists accounted for less than 1% of total travel during the analyzed period, while those in Asia had the highest share of the analyzed period in 2018 when they accounted for 1.5%. Travel in Africa had the largest share in 2017 when it accounted for 0.4% of the total of this year. Although there are certainly tourists who also traveled to South America, there is no statistical data to prove this

Table 3. Holidays and business trips abroad, by countries of destination (2014-2016) (number)

	2014		2015		2016	
	Holiday trips	***Business trips***	***Holiday trips***	***Business trips***	***Holiday trips***	***Business trips***
Total	**1,013,478**	**86,920**	**1,065,010**	**121,442**	**1,000,025**	**92,697**
Europe	994,950	84,073	1,050,525	118,637	993,793	86,361
U.E.	955,589	80,641	982,453	115,790	383,596	84,611
Asia	3,719	1,045	7,188	-	3,516	5,192
North America	14,061	1,802	6,831	-	2,716	1,144
Central and South America	-	-	-	2,062	-	-
Africa	748	-	466	743	-	-

Source: own processing, Romania's Tourism Roundup.

As far as business trips are concerned, we find that there is the same trend, that of travel in Europe. For the other continents, we find that the largest share of business trips in Asia was recorded in 2017 when they accounted for 9% of the total, in North America in 2014 when they accounted for 2% of the total, and in South America, the only year in which travelers were registered was 2015, which was 1.7%.

Table 4. Holidays and business trips abroad, by countries of destination (2017-2018) (number)

	2017		2018	
	Holiday trips	***Business trips***	***Holiday trips***	***Business trips***
Total	**1,058,499**	**102,011**	**1,236,809**	**96,136**
Europe	1,038,706	92,876	1,215,275	95,461
U.E.	977,242	92,876	1,161,628	91,545
Asia	12,700	9,135	18,230	-
North America	3,145	-	1,700	-
Central and South America	-	-	-	-
Africa	3,948	-	998	-

Source: own processing, Romania's Tourism Roundup.

Globalization has influenced the way of selling tourist packages, as evidenced by the existence of franchises, partnerships, etc. "Tour operators and travel agencies have made partnerships with hotel chains, charter airlines, travel products distributors, and cruise companies, some of whom have joined" [8].
Analyzing the situation of tourism agencies that provide services for tourists, we distinguish them from the agencies that offer sales packages of touristic packages and tour operators. It is noticed that the number of foreign tourists appealing to sales agents has

increased from 1,808 in 2014 to 10,523 in 2018 (Table 5).

Table 5. Number of tourists taking part in the tourist actions organized by travel agencies *(thousands)*

	Incoming Activity		Activity of domestic tourism		Outgoing Activity	
	2014	2015	2014	2015	2014	2015
Tour operator agencies - Number of tourists – total	218	254	375	431	710	506
Agencies with sale activity - Number of tourists – total	2	2	127	134	317	323
	Incoming Activity		**Activity of domestic tourism**		**Outgoing Activity**	
	2016	2017	2016	2017	2016	2017
Tour operator agencies - Number of tourists – total (thousands)	74	105	591	670	541	747
Agencies with sale activity - Number of tourists – total	3	9	163	94	409	153
	Incoming Activity		**Activity of domestic tourism**		**Outgoing Activity**	
	2018		**2018**		**2018**	
Tour operator agencies - Number of tourists – total	112		959		805	
Agencies with sale activity - Number of tourists - total	11		187		349	

Source: own processing, Romania's Tourism Roundup.

The number of Romanian tourists who used their services either for holidays in the country or for holidays abroad increased from 2014 to 2016, registering a 77% decrease in 2017 compared to the previous year for departures abroad and 42 % for holidays in the country. In 2018 there was a rebound in the activity of these agencies. In what concerns the holidays in the country, we consider that the granting of holiday vouchers to the budgetary employees contributed to the increase of the number of tourists. But the data shows that the number of Romanian tourists who have spent their holidays abroad has increased.

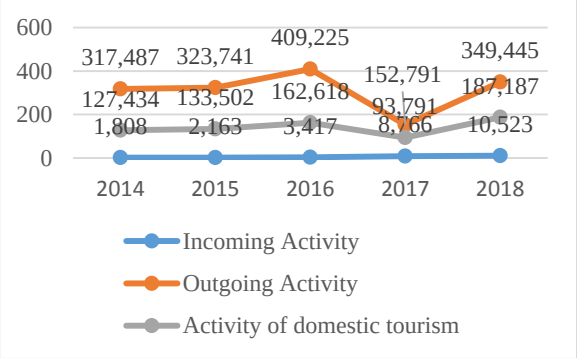

Fig. 1. Evolution of the number of tourists who have turned to agencies with sales activity
Source: Data processing from the Romania's Tourism Roundup

This has probably also contributed to the increase in wages this year, which has led the Romanians to contribute to the globalization process, as far as the tourism sector is concerned (Fig. 1).

The tour operators has had a number of operators have called for a larger number of tourists, owing to the fact that there is a large number of agencies in Romania, and on the other hand they do a lower commission than those with sales activity. At 2018, the average travel agent's fee was 8.3%, compared with 9.1% for sales agents.

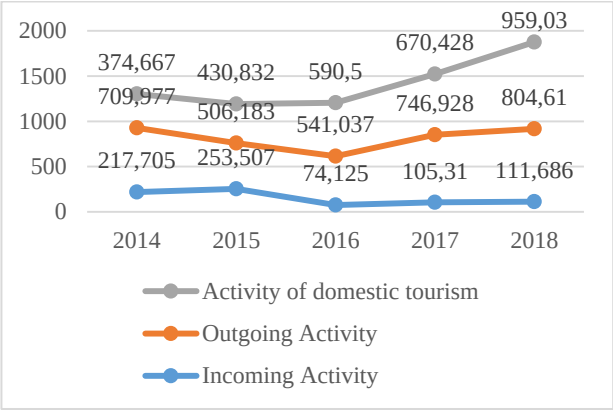

Fig. 2. Evolution of the number of tourists appealing to tour operators
Source: Data processing from the Romania's Tourism Roundup.

Analyzing the activity of these agencies, however, we find that they are not tour operators in the real sense, they actually resell touristic packages provided by other tourist networks or taken over from the two big players on the Romanian tourist market Tui Travel and Happy Tour.

The data highlighted in Fig. 2, we find a linear evolution of the number of Romanian tourists who preferred as a vacation destination Romania, compared to the tourists who used the agencies for vacancies outside the country decreased during the analyzed period except for the year 2017.

Also the number foreign tourists who used a travel agency to come to Romania were down. Corroborating this data with the number of foreign tourists, we find that they preferred to come up with their own account without resorting to the services of travel agencies.

Analyzing the number of Romanian tourists who have used the services of tourist agencies to travel to the country, we find that European countries are not in this ranking, given that the National Statistics Institute's data refers to the first 10 countries among the agencies.

Table 6. Number of Romanian tourists taking part in the external tourist actions

	Tour operator agencies		***Agencies with sale activity***	
	2014	**2015**	**2014**	**2015**
Africa	7,522	4,622	555	585
North America	2,959	2,117	3,955	984
Central and South America	3,812	1,930	793	2,904
Asia	7,581	8,874	3,050	3,331
Australia, Oceania and other territories	388	180	-	112
Countries and territories not specified	-	-	-	-
	Tour operator agencies		***Agencies with sale activity***	
	2016	**2017**	**2016**	**2017**
Africa	1,024	4,480	818	1,249
North America	1,966	9,423	981	671
Central and South America	2,114	2,956	3,354	1,985
Asia	11,852	30,449	9,585	7,724
Australia, Oceania and other territories	877	213	355	463
Countries and territories not specified	-	-	160	-
	Tour operator agencies		***Agencies with sale activity***	
	2018		**2018**	
Africa	12,598		5,981	
North America	5,527		458	
Central and South America	2,270		2,896	
Asia	29,976		7,698	
Australia, Oceania and other territories	30		89	
Countries and territories not specified	-		-	

Source: own processing, Romania's Tourism Roundup.

Fig. 3. The evolution of the number of Romanian tourists who have used the tour operators for excursions abroad
Source: Data processing from the Romania's Tourism Roundup.

Thus, in the first place among the preference of Romanian tourists eager to travel to the tour operators, there is, throughout the analyzed period, Asia, followed by Africa. Third place is North America, followed by South America, followed by Australia, Oceania and other territories (Fig. 3).

Analyzing the situation and from the point of view of the agencies with sales activity we find that the distribution of the 1st place was made between different destinations. Thus, Africa ranks first in 2018, North America ranks first in 2014, Central and Upper America in 2015, and Asia ranked first in 2016 (Fig. 4).

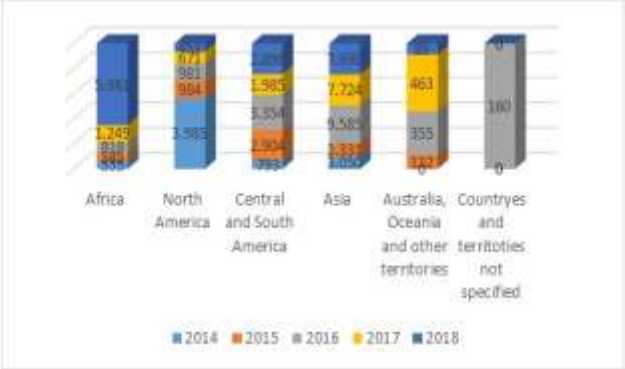

Fig. 4. Evolution of the number of Romanian tourists who chose excursions abroad through sales agencies
Source: Data processing from the Romania's Tourism Roundup.

As we can see, there are several factors contributing to the globalization of tourism, competitiveness and attractiveness on the tourism market being given by the revenues from this industry [1].

Although Romania does not register a large number of tourists compared to other European states, there is an improvement in the tourism activity, both in terms of domestic and foreign tourism. By developing tourism, it brings income not only from accommodation but also from other related services that could contribute to sustainable economic growth [6]. But this will have to be accompanied by the development of the infrastructure, the promotion of those particular elements of Romanian tourism, namely culture, traditions, crafts.

It is clear that tourist destinations have to establish identities that differentiate them from other destinations, as globalization has stimulated competitiveness and created a much more complex environment, this being reflected also by the prices and quality of tourism products and services [5].

CONCLUSIONS

Globalization is a phenomenon that cannot be prevented, which has brought both advantages and disadvantages with its emergence. In tourism, globalization is all the more obvious given the reduction of borders, the development of technologies that have contributed on the one hand to better and easier information of tourists, and on the other hand to facilitate the ways to travel.

Although in recent years the number of Romanian tourists who have crossed the borders of the country, both for business purposes and for the holidays, has increased, compared to other countries the number of this remains small. As regards foreign tourists who arrived in Romania, we find the same thing, namely an increase in their number, but compared to other countries, their number is quite small.

Although Romania benefits from tourist attractions, this being appreciated by both Romanian and foreign specialists, there are numerous barriers in its development. They are related both to the infrastructure, but also to the mentality, the international competition, the investments that need to be made in this field.

The strengths that Romania should exploit for the development of tourism are related to rural tourism, ecotourism, cultural tourism, this must be completed by a good promotion, efficient communication with the business environment, as well as with public authorities, so in context to globalize tourism, Romania to become competitive.

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SANDY SOILS FROM OLTENIA AND CAREI PLAINS: A PROBLEM OR AN OPPORTUNITY TO INCREASE THE FOREST FUND IN ROMANIA?

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Abstract

In Romania, the afforestation projects of degraded terrains are carried out in accordance with the technical norms issued by the ministry responsible for forest management. According to recent statistics, across the country there is a significant area of different types of degraded lands, more than 0.4 million hectares being affected by wind erosion. The goal of this study was to highlight the best afforestation alternative for the sandy soils across Oltenia and Carei Plains, corresponding to ecological group number 93 of the Technical Norms regarding the compositions, schemes and technologies for forest regeneration and afforestation of degraded lands. The best alternative resulted by using an Analytic Hierarchy Process, that took into account eight criteria. The combination between black locust and bird cherry proved to be the best choice. The significant area of sandy soils across Romania, but especially the lands from Oltenia and Carei Plains should be regarded rather as an opportunity to increase the forest fund through afforestation than a problem for the local communities and national economy.

Key words**:** *afforestation, AHP, Carei Plain, Oltenia Plain, sandy soils*

INTRODUCTION

In Romania, forests account for 6.565 million hectares (27.5% of the total territory), most of them being distributed in mountain region (*i.e.* 59.7%), a third in hilly area (*i.e.* 33.8%) and only a small share in plain regions (*i.e.* 6.5%). The dominant species consist in beech (*Fagus sylvatica* L.), which accounts for 32% of the total forest area, followed by Norway spruce [*Picea abies* (L.) H. Karst.; 19%], oaks (Genus *Quercus* L.; 18%), silver fir (*Abies alba* Mill.; 5%) and other hardwoods [17]. The distribution of the forests on the main three historical regions (*i.e.* Transilvania, Muntenia and Moldova) in uneven, the forests across Transilvania accounting for a little bit more than the total forest area from the other two historical regions [15]. The same pattern exists also at county level, the ratio between the county with the lowest forested area and the one with the highest being 1:20 [3].

Several factors contributed to the current situation, deforestation, degradation of forests and/or irrational logging being perhaps the ones with the highest impact. As a consequence, nowadays there are large areas across Romania that are vulnerable to desertification, the main ones being Southern Oltenia (known as "Sahara României"), Southern Moldova, Western Plain and Dobrogea [4], [6]. It is estimated that the total area affected by wind erosion in Romania accounts for 0.4 million hectares [1], out of which 250.000 hectares are located in Southern Oltenia [13]. The main factors that contributed in the last decades to the increasing area of sandy soils in this region are represented by irrational human activities, such as destruction of the irrigation systems and deforestation [21] and specific site conditions, such as the annual amount of precipitation which recorded the lowest value of 262.7 mm in 1992 [16]. From climatic perspective, Oltenia is known as the region from Romania that is very sensitive to drought [7]. In this context, the reforestation initiatives from the region that were restarted two decades ago, most of them using black locust monocultures are more than welcome. One example is the reforestation project surrounding Mârșani locality (Photo 1). In this

region the established forest stands represent the best economically land use option for the owners of degraded sandy lands [20].

Photo 1. Young black locust forest from Mârșani, Dolj County, Oltenia Plain (44.044899, 23.971666)
Source: original photo.

Another region vulnerable to drought and rich in sandy soils is Carei Plain. The pattern is similar with the one from Oltenia Plain (*i.e.* a low percentage of forests) [12], the majority of forest stands being mixed, as in the case of Mare Foieni Forest (Photo 2).

Fig. 2. Mare Foieni Forest, Satu Mare County, Carei Plain (47.727665, 22.304682)
Source: original photo.

The aim of this study was to compare different alternatives of afforestation of the sandy soils from Oltenia and Carei Plains.

MATERIALS AND METHODS

According to the Technical Norms regarding the compositions, schemes and technologies for forest regeneration and afforestation of degraded lands [18], the lands with sandy soils from Oltenia and Carei Plains are included into ecological group number 93. These lands are covered by sand dunes that could reach two-three meters (Photo 3) or even eighteen meters, as is the case in Mârșani (Photo 4).

Photo 3. Sand dunes in Mare Foieni Forest, Satu Mare County, Carei Plain (47.727665, 22.304682)
Source: original photo.

The four alternatives recommended by the norms for the afforestation of these lands are the following ones: *Alternative 1*: 5-6 St + 4-5 Pl, Pl.c, Aj, Arb; *Alternative 2*: 6-7 St (St.b) + 3-4 Te.a, Fr, Ci, Ar, Pă + Arb; *Alternative 3*: 10 Pl.c, Pl and *Alternative 4*: 5 Sc + 5 Ml, respectively (St – pedunculate oak (*Quercus robur* L.), Pl – silver poplar (*Populus alba* L.), Pl.c – grey poplar [*Populus* x *canescens* (Aiton) Sm.], Aj – accessory species, Arb – shrub species, St.b – greyish oak (*Quercus pedunculiflora* K. Koch), Te.a – silver linden (*Tilia tomentosa* Moench), Fr – European ash (*Fraxinus excelsior* L.), Ci – wild cherry (*Prunus avium* L.), Ar – Tatar maple (*Acer tataricum* L.), Pă – European wild pear [*Pyrus pyraster* (L.) Burgsd], Sc – black locust (*Robinia pseudoacacia* L.) and Ml – bird cherry (*Prunus padus* L.), respectively).
In order to determine the best alternative for afforestation, an Analytic Hierarchy Process (AHP) was performed. AHP was described by Professor Thomas Saaty four decades ago, being nowadays used in several research projects based on multi-criteria decision analysis [10], [11]. The goal of this study (*i.e.* choosing the best alternative for afforestation of sandy soils) was decomposed into eight criteria that were independently analyzed. The chosen criteria consisted in: 1 – **number of species used** (the diversity of future forest; 1:

lowest number… 4: highest number), 2 – **diversity of non-wood forest products** (1: lowest diversity … 4: highest diversity), 3 – **age of harvesting of the future forest** (1: highest age … 4: lowest age), 4 – **production and availability of forest seedlings** (1: the most complicated … 4: easiest), 5 – **root system** (1: less developed … 4: best developed), 6 – **speed of growing** (1: lowest speed… 4: highest speed), 7 – **generative regeneration** (including the age when the young trees start to produce seeds; 1: lowest age … 4: highest age) and 8 – **vegetative regeneration** (1: lowest … 4: highest), respectively.

Photo 4. Sandy soils from Mârşani, Dolj County, Oltenia Plain (44.044899, 23.971666)
Source: original photo.

AHP was performed by the aid of Expert Choice Desktop software (version 11.5), and the four alternatives were compared one to each other by taking into account the eight selected criteria.

RESULTS AND DISCUSSIONS

AHP ranking (4 alternatives x 8 criteria) is given in Table 1. Among the considered alternatives, the forth one (equal shares of black locust and bird cherry) proved to be the best option for afforestation of sandy soils from Oltenia and Carei regions (Fig. 1).

Table 1. AHP alternative ranking

Criterion	Alternative			
	1	**2**	**3**	**4**
1	3	4	1	1
2	3	4	1	2
3	2	1	3	4
4	2	1	3	4
5	3	4	1	2
6	2	1	4	3
7	3	2	4	1
8	2	1	3	4

Source: Original data.

Out of the more than fifty trees and shrubs which are often used for afforestation of degraded lands across Romania [9], black locust is a species that was planted both for productive and protective purposes, especially for controlling the wind erosion [8]. Bird cherry is also a fast growing species and due to its tendency to form thickets is an excellent species for windbreak shelterbelts [14].

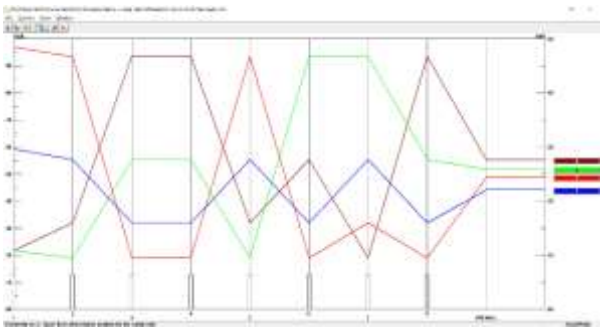

Fig. 1. The ranking of the four alternatives
Source: original.

As regards the other species proposed by the norms, in the current context of climate aridity from some regions across Romania [19], special attention should be given to greyish oak, a species that is well adapted to arid site conditions in comparison with other oak species [5]. Important steps were done in this direction, a grayish oak seed orchard being recently installed in steppe region from southeastern part of the country [2].

CONCLUSIONS

The combination between black locust and bird cherry proved to be the best choice for afforestation of the sandy soils across Oltenia and Carei Plains. The main advantages of these two species consist in their ability to grow fast and to stabilize the "flying sands" usually in less than five years. These species are also preferred, to the detriment of the others proposed by the technical norms, due to the fact that their seedlings are very easy to produce in the nurseries and their prices are affordable.

The large area of sandy soils across Romania, but especially the ones concentrated in Oltenia and Carei Plains should be regarded rather as an opportunity to increase the national forest fund of Romania, than a problem for the local communities and national economy.

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OVERLAPPING BETWEEN THE HUNTING SEASONS OF THE MAIN GAME SPECIES AND THE PICKING INTERVALS OF TRUFFLES IN ROMANIA

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Abstract

Truffle picking and hunting are two forest-related activities able to steer hot disputes over the forest sustainability. The reason is simple: hunting and truffle picking, at the same time and within the same forest, may cause deadly accidents. Across Europe, there are several countries with long tradition in picking truffles and hunting, such as Italy, France or Spain, but the legal framework regarding these doings differ from country to country. The goal of this study was to highlight the overlapping between the picking intervals of the main truffle species with the hunting periods of the most common wildlife species of hunting interest across Romania. In addition, for some of the most common game species, the assessed population size was also presented. Data regarding the assessed population size of the wildlife species was centralized from the website of the central authority responsible for wildlife management. In case of truffles, data contained by recently published scientific papers and information available on specialized and popular websites from Romania were compiled in order to figure the picking periods across the year. In general, the harvesting seasons of the truffles is overlapping in October, November and December, when the hunting is permitted for most of the game species.

Key words**:** *game species, hunting, NWFPs, truffle, wildlife*

INTRODUCTION

Nowadays, the truffles and the game products are perhaps the most valued non-wood forest products (NWFPs) worldwide, but especially in European countries. Truffle market is considered to be one of the most exclusivist, and also the most volatile in terms of prices. For example, in Italy, the price paid eight years ago for almost one kilogram of white truffle was 105,000 Euros [5].

The truffles (family *Tuberaceae* P.Micheli ex F.H.Wigg.) are hypogeous fungi growing in symbiosis with a broad diversity of angiosperm and gymnosperm species in a variety of habitats [12], being distributed mainly in the northern hemisphere. Most of the species belong to genus *Tuber* P.Micheli ex F.H.Wigg., that contains almost two hundreds species [1] of socio-economic importance [2], approximately twenty of them being found in Europe, the summer truffle (*Tuber aestivum* Vittad.) being the most common across European countries [3]. Eight of them are appreciated for their gastronomic value, namely the black truffle (*Tuber melanosporum* Vittad.), the truffle of the White Madonna (*T. magnatum* Pico), the summer truffle (*T. aestivum* Vittad.), the brumale truffle (*T. brumale* Vitt.) the smooth black truffle (*T. macrosporum* Vittad.), the whitish truffle (*T. borchii* Vittad.), *T. mesentericum* Vitt. and *T. oligospermum* (Tul. and C. Tul) [4], especially the first two [14], [17] in Italian, Spanish, French and Croatian cuisines [18], but also in Poland, the truffles being considered as rare fungi [21]. In Italy, Spain and France, the highest quantities of black truffles originate from special cultures, called truffières [22]. For the moment, in Romania, only the summer truffle was introduced in culture [6].

It is difficult to estimate how many truffles pickers are operating in Europe since not all

of them are registered in associations or other legal entities. Instead, in many countries across Europe, tens of thousands or even hundreds of thousands of hunters exist. For example, according to the report issued by the European Federation of Associations for Hunting & Conservation, almost a decade ago, more than 60,000 hunters were recorded in Romania [10]. The numbers are even higher in countries with a long tradition in hunting, such as France, Spain, United Kingdom or Italy [10].

In Romania, according to the definition provided by the Forest Code, the NWFPs include, among others, forest fruits, medicinal and aromatic plants, game products, edible mushrooms and truffles, a.s.o.

Black truffle, summer truffle, truffle of the White Madonna and brumale truffle represent the main truffle species of harvesting interest in Romania [4], the first one being the most spread species [7]. Their main host-trees belong to different oak species (*Quercus* spp.), common hazel (*Corylus avellana* L.), European hornbeam (*Carpinus betulus* L.), linden species (*Tilia* spp.), Norway spruce [*Picea abies* (L.) H. Karst.], common beech (*Fagus sylvatica* L.), black pine (*Pinus nigra* Arn.), poplars (*Populus* spp.) or willows (*Salix* spp.) [3], [7], [13]. Having in mind that the beech, Norway spruce and oaks account, in total, for more than 70% of Romanian forests, the potential for truffles picking is quite high.

However, there are some constraints that limit the distribution of the truffles in Romania, such as the soil conditions. For example, the truffle of the White Madonna and the black truffle require soils formed on limestone well supplied with water all year long [3]. This is why *T. magnatum* can be found in the southern Romania, especially in mixed-oak stands [7]. Contrasting other truffles that prefer the alkaline soils, the summer truffle grows also into soils with pH ranging from 6.6 to 7.3. It is able to tolerate a large spectrum of soil textures, but the soil must be well aerated and must have a constant humidity [7].

Currently, several truffle picking techniques are known. Some of them are based on observing the soil cracks or by telling a specific sound produced when the soil is being hit, or by observing the flight of certain insects. There are also more precise methods, such as using pigs or trained dogs [7].

As regards the game species, in Romania the hunting is permitted for 18 mammal species and 39 bird species. The list of these species is provided by the Annex no. 1 of the Law no. 407/2006 - Law of Hunting and Wild Fauna Protection. Red deer (*Cervus elaphus* L.), European roe deer (*Capreolus capreolus* L.), wild boar (*Sus scrofa* L.), common pheasant (*Phasianus colchicus* L.), European hare (*Lepus europaeus* Pallas) are among the most important game species for which the hunting is permitted. Romania is also known for its populations of large carnivores of European importance, such as gray wolf (*Canis lupus* L.), brown bear (*Ursus arctos* L.) and wildcat (*Felis silvestris* Schreber). As regards these species the hunting is derogated when and where the damages produced to the local livestock are too numerous. So, between 2007 and 2015, as many as 12,169 large carnivores were hunted, out of which 3,636 were brown bears, 4,554 gray wolfs, and 3.981 wildcats, respectively [9].

In Romania, the hunting realm stretches over 21.9 million hectares, being divided into 2,151 hunting grounds, most of them (1,873) being managed by hunters' associations, by National Forest Administration Romsilva (255) and only a few (23) by forest research and academic institutions. Most of the hunting grounds are located in plain regions (41.7%), followed by the ones in hilly (37.5%) and mountain regions (20.8%) [15].

If the hunting has long been regulated by different laws and formal instructions (regarding the hunting periods and the annual quotas of hunting), the situation is not well clarified at all when it comes to truffles picking. According to paragraph (4) of the Article 58 of the Law no. 46/2008, the forest products belong to the landowners, with the exception of game and wildlife fish.

The situation becomes more complicated if we take into account the next paragraph (5) of the same article, according to which the harvesting of the NWFPs specific to the national forestry fund shall be made on the basis of the licenses issued by the forest districts, in accordance with the instructions provided by a ministerial order. Up to present, no normative act was issued in this respect. By December 2016, a set of technical norms was produced in order to regulate the harvesting of these products and it was published on the website of the central authority responsible for forest management [16]. The bill contained a list of 120 mushroom species and 171 herbaceous plants, shrub and tree species that were considered of high interest. Among them, seven taxa of genus *Tuber* were listed [16].

Under these circumstances, some NFA regional directorates reduced the harvested quantities. For example, Arad and Gorj Forestry Directorates imposed the limit of two tons per year [8], [19].

In other European countries, the situation is different. For example, in Croatia, there is a unique season for picking all truffles species (*i.e.* 15.09-31.01) and the pickers must buy permits in order to harvest truffles from the state-owned forests [23]. In Serbia, the pickers should pay a tax for harvesting and trading with truffles [20].

In European countries where the truffle market has been developed, several associations and federations are registered. For example, in Spain there is the *Truffle Harvesters Federation* [11], while in Italy two national federations exist, namely *Federazione Italiana Tartuficoltori Associati*, for truffle growers and cultivators and *Federazione Nazionale delle Associazioni dei Tartufai Italiani*, for the truffle hunters and another two truffle hunters associations are based in Istria, Croatia [23]. In Romania, according to our knowledge, there was recently established an association based in Bucharest, namely *Asociația Căutătorilor de Trufe din România*.

The purpose of this study was to highlight the overlapping between the picking intervals in the case of truffles with the hunting periods of the main game species across Romania. Moreover, for some of the most common game species, the evaluated population size was also highlighted.

MATERIALS AND METHODS

The hunting periods of the main species of fauna are provided by the legal framework (Law no. 407/2006). The population size of the wildlife species of hunting interest was assessed based on the data from the last two hunting seasons which is available on the website of the central authority responsible for wildlife management.

In case of truffles, since there is no official document that states the picking intervals, data from scientific papers and information from specialized and popular web-sites from Romania (*i.e.* http://www.trufarom.ro/ and https://trufesiciuperci.wordpress.com) were compiled in order to figure out the picking periods across the year.

RESULTS AND DISCUSSIONS

Among the game species of hunting interest from Romania, European hare, wild boar, red deer, pheasant and grey partridge are among the most common species.

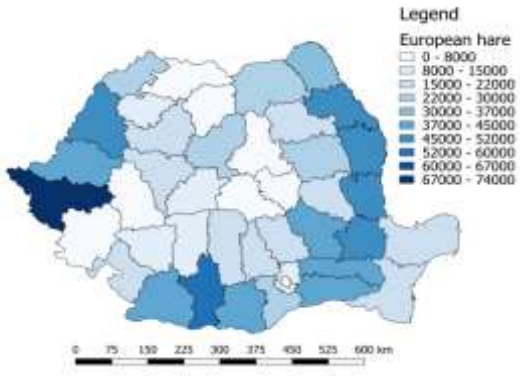

Fig. 1. European hare (*Lepus europaeus* Pallas.) population size
Source: http://apepaduri.gov.ro/efective/

The population size of *Lepus europaeus* is given in Figure 1. The highest concentrations of European hare individuals were found in Timiș County (Western Romania) followed by the ones from the eastern and southern

parts of Romania, respectively. The smallest populations were recorded in the districts located along the Carpathians (*e.g.* Hunedoara, Sibiu, Brașov, Covasna, Harghita, etc.).

The biggest population of wild boar (*Sus scrofa* L.) is also found in Western Romania, in Arad and Bihor Counties (Figure 2).

Among the 41 counties across Romania, Brăila and Galați (Central-Eastern Romania) counties recorded the lowest populations.

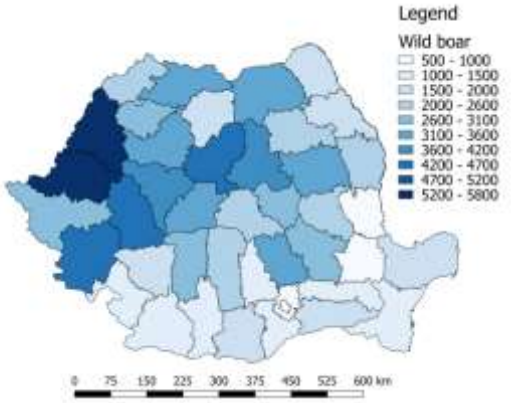

Fig. 2. Wild boar (*Sus scrofa* L.) population size
Source: http://apepaduri.gov.ro/efective/

Red deer (*Cervus elaphus* L.) prefers habitats with high percentage of forests as it is the case of the districts located in northern Romania, especially Suceava County (Figure 3). Few individuals were recorded in the districts from the southern part of the country.

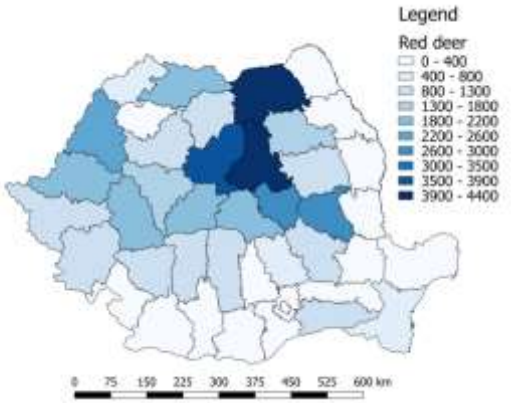

Fig. 3. Red deer (*Cervus elaphus* L.) population size
Source: http://apepaduri.gov.ro/efective/

Like in the case of European hare, the biggest population of pheasant (*Phasianus colchicus* L.) was recorded in Timiș County, Western Romania (Figure 4). This species is less common across the counties from the eastern part of the country.

Unlike the above-mentioned species, in the case of grey partridge the biggest population was located in the southern part of the country, mainly in Olt, Dolj and Teleorman counties (Figure 5).

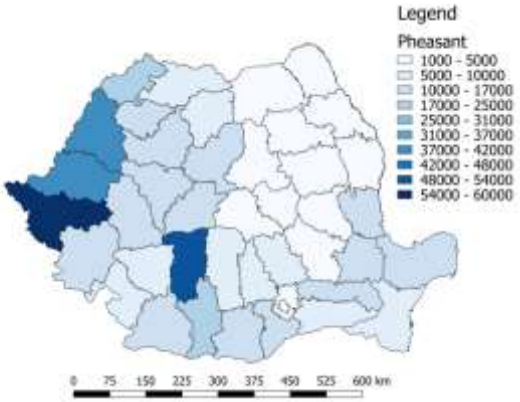

Fig. 4. Common pheasant (*Phasianus colchicus* L.) population size
Source: http://apepaduri.gov.ro/efective/

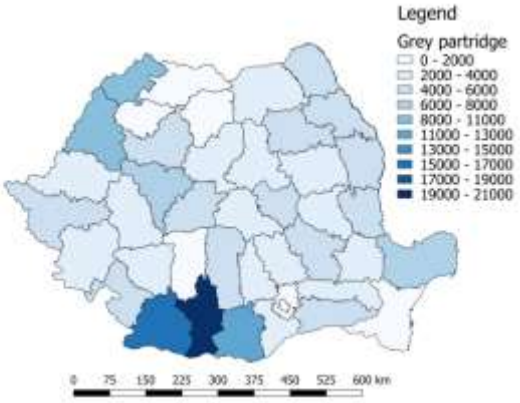

Fig. 5. Grey partridge (*Perdix perdix* L.) population size
Source: http://apepaduri.gov.ro/efective/

The hunting season of the main game species and harvesting season of the truffles in Romania is given in Table 1. Since, according to the legislation, a new hunting season starts in May, this month was chosen as reference. As it can be seen from the table, there are game species that have a short hunting season (*e.g. Dama dama*, *Marmota marmota*, *Streptopelia turtur* or *Alauda arvensis*) and species for which hunting is permitted almost the whole year.

As regards the truffles, the picking interval is between May and March.

It seems that the harvesting seasons of the truffles is overlapping in October, November and December, when the hunting is permitted for most of the game species.

Table 1. Hunting seasons of the main game species and harvesting seasons of the truffles in Romania

Game, birds and truffles	Month 5 6 7 8 9 10 11 12 1 2 3 4 5
Capreolus capreolus (male)	
Canis aureus, Sus scrofa (male), *Vulpes vulpes*	
Sus scrofa (female and piglet)	
Meles meles	
Ondatra zibethica	
Capreolus capreolus (female), *Cervus elaphus* (female and offspring), *Dama dama* (female and offspring)	
Cervus elaphus (male for selection)	
Dama dama (male for selection), *Rupicapra rupicapra* (individual for selection)	
Martes sp, Mustela erminea, Mustela nivalis, Nyctereutes procyonoides, Oryctolagus cuniculus, Putorius putorius	
Ovis aries musimon	
Cervus elaphus (male for trophy)	
Marmota marmot	
Rupicapra rupicapra (individual for trophy)	
Dama dama (male for trophy)	
Lepus europaeus	
Corvus corone cornix, Corvus corone sardonius, Pica pica	
Corvus monedula	
Streptopelia decaocto, Sturnus vulgaris	
Anser anser rubrirostris, Anas penelope, A. strepera, A. clypeata, Aythya ferina, A. marila, Bucephala clangula	
Anas acuta, Corvus frugilegus	
Coturnix coturnix	
Streptopelia turtur	
Gallinula chloropus, Gallinago gallinago, Garrulus glandarius, Lymnocryptes minimus, Scolopax rusticola, Turdus iliacus, T. philomelos, T. pilaris, T. viscivorus	
Anas crecca, Columba oenas, C. palumbus, Fulica atra	
Aythya fuligula	
Perdix perdix	
Bonasa bonasia	
Alauda arvensis	
Phasianus colchicus	
Anser albifrons	
Tuber aestivum	
Tuber brumale	
Tuber magnatum	
Tuber macrosporum	
Tuber mesentericum, T. uncinatum, Choiromyces meandriformis	
Tuber excavatum	

Source: Law no. 407/2006, http://www.trufarom.ro/ and https://trufesiciuperci.wordpress.com

CONCLUSIONS

In general, there is a high level of overlapping between the hunting periods of the main game species and the picking intervals of truffles.

Since the Romanian legal framework regarding the truffles picking is not clear at all, and the hunters' associations work on a solid legal base, the potential risk of conflicts between the two categories of stakeholders is very high.

Poaching is another important threat for both, either hunters or truffle pickers and, therefore, a thorough regulation in both sectors is

mandatory, especially on public forests, where the communication between truffle pickers and forest rangers is weak and based on informal connections.

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IMPROVING PERFORMANCE OF FLAT-LINK CHAIN FEEDER IN POULTRY HOUSES

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Abstract

The main objectives of this study to test the chain feeder system before and after modifying under three levels of chain feeder speeds was 25,30 and 35m/min and three levels of opening gate feed area was18,27and 36 cm².this modification using bearing with corner wheel lead tominimize energy and wearing between corner wheel feeder chine to increase the efficiency of chain feeder with subtle amount of forage components on trough chicken nurture. The results showing increased the Feeding rate of feeder from 31 to 81 kg/min when opening feed area increased from 18 to 36 cm² at 25 m/ min chain speed , at the same conditions, the total amount of feed increased the Feeding rate of feeder from 620 to 1,620 g/m Also the Feeder efficiency increased from 36.90 to 96.40% when using the opening feed area increased from 18 to 36 cm² at 25 m/ min chain speed The feeding system performance was evaluated under with and without load, the power requirement with ordinary fillers before modified deceased from 1.089 to 0.941 kW withload and without load at 25 m/ min chain speed also deceased from 1.026 to 0.846 kW withload and without load at modified system. The feeder chine loses increased from 280 to 900 g. when opening feed area increased from 18 to 36 cm² .Also Wearing behaviour compared between wheel before and after using bearing the wearing rate decreased from 0.90 to 0.35g/h before and after modified.

Key words**:** *poultry, chain feeder, losses, power, and wearing*

INTRODUCTION

Now A poultry house must be suitable for large scale production need to modern buildings and professional farm management addition to the equipment that are constructed in house should acceptable in size, watering, feeding, cleaning and ventilation systems also will reduction of labour number . The use of modern equipment makes it possible for huge number of chicken to control in all operation**s** in poultry house.[6] The optimum nutrition of broiler happened by automating a controlled feeding system, the automated equipment was helpful be applied in poultry projects [5]

This is a great potential, considering that maize is an important component, accounting for more than 60% of the poultry ration.[1]

The feeding equipment design be different on dissimilar farms. A lot of construction style were used to avoid waste the feeding devices should be easy to fill and clean. .The chickens cannot stay on one place, so the feeder constructed for all chicken to be able reach to feed. Automatic and mechanical feeders were fabricated as standard equipment on broiler farms. They keep fresh feed available to the chickens at all times and minimize of labour [8]

A lot of poultry farm were depended upon efficient and reliable mechanized systems of feeding hen. The automatic return switch reversing when the hopper unit reaches the far end for refilling. [2]

To minimize waste in feeding systems and keep the level of feed in the trough low using a deep trough with waste prevention lips. [4] .

Traveling hoppers are easily automated to operate at desired intervals with timers and automatically refilled between feedings; the cycle of feed above the cages or on the floor and dispense feed directly into the trough. Most troughs are flat bottom with one flared side. The traveling hoppers are lower initial cost than closed loop feeders. The chain travels at 100 to 500 mm/s depending on user

preference with 200 to 300 mm/s being common. [7]

Wear is a type of surface damage that arises from the relative motion between inter acting solid surfaces. It is a dynamic and complex process which incorporates surface and material proper ties, operating conditions, stresses, lubricants an d geometry [3].

A lot of problem happened in Flat-link chain feed system such as increase in friction resulting from wearing between wheel of corner and chain. The chain travels number and chain speed affected on feed homogeneous and distribution in the line feeder.

So The main objectives of this study to minimize wearing between corner wheel feeder chine and increase the efficiency of feeder with subtle amount of forage components on trough through chicken nurture.

MATERIALS AND METHODS

Field experiments were conducted at (Aga),(El-Mansoura), in private broiler house, Egypt. Closed house and Cobb 500 hen were used. The egg production for farms with capacity of 4 million eggs per year 2018. The periods of the experiments were 60 weeks. The environmental conditions were adjusting according to the ideal parameters. To study the modification the feeder on power consumption, wearing, losses of feed and egg-weight of hen.

Closed house: Five floor have (widths 12.5 and length 84 meters) the floor capacity were 4,000 hen. There are two periods the first called breeding period has24 weeks and second has 40 weeks is called production period. Feed type has six stages recommended aimed at female hen feed for session and divided according to the proportion of protein every age. Drinking system have three lines in the hen housed one line length is 81m for each line contains 27 pieces length of piece 3m each pieces have 12 nipple one of them enough to 12 bird Ventilation system evaporative cooling system were used, it have 8 ventilators each one 1m * 1m distributes air for 44,000 m^3/h with 6 brushes. Heating system have air forced heater consists of (furnace made of stainless steel, counter flow heat exchanger , axial fan)

Feeding system: The Closed loop floor chain feeder system as showing in Fig.1. consists of five basic components:

-Hoppers: The capacity differs according to the size of the hopper. (Width 1m * length 1m * height 1m) and the number of feed lines with volume 200 kg

-Trough: The ideal shape for width 9 cm and height9cm Length of part 300 cm, the external line was 186 m and the internal line was 174 m

-Chain: A chain consists of varying links. Each link has small facet to pushes the forage during the movement of chain by motor

-Corners: Designed to change direction 90°.

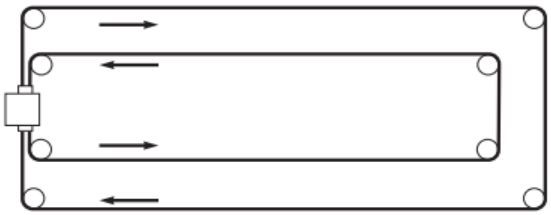

Fig. 1. The feeding system two line with two way drive
Source: Floor Chain Systems Catalog

The wheels in combination with synthetic bushes allow smooth operation even at speeds as showing in Fig .2

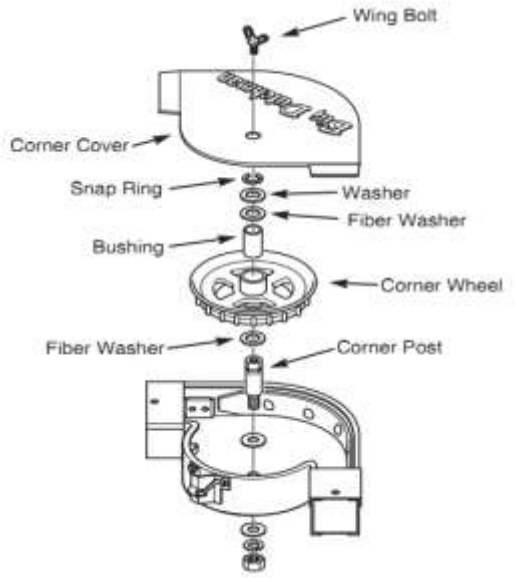

Fig.2. Corner wheel component's
Source: Floor Chain Systems Catalog

Fig.3 Bearing and coroner wheel
Source: Author's own illustration.

Fig.4.Corner wheel before and after wearing
Source: Author's own illustration.

Parameters under study

Test the chain feeder system before and after modifying under this factors:

-Chain feeder speeds three levels 25,30 and35m/min

-Opening feed area of three levels 18,27and 36 cm²

Measurements

-**Feed consumption** of 4,000 hens estimated daily 140 g./hen .

-Feeding rate of feeder defined as the total amount of feed per time

-Total amount of feed for one meter from feeder chain according to chain length 340 m. and hoppers capacity 200 kg, the ideal amount of feed for one meter from feeder chain was 1,680g/m

-Feeder efficiency (FC) can be calculated by**:**

FC=(total amount of feed /Ideal amount of feed**)**× 100

-Operating feeding time defined as the total time during operating feeding system to end the recommended feed for each hen

-Forage losses were estimated from standing chicks in trough during feeding process, chick legs on the floor. Also chain fails and hulling trough are other sources of forage loss.

-Wearing measurement. The amount of wear can be described by the absolute mass loss (in grams), or mass loss per unit (grams per time), also by a fractional change in the mass of the part involved. According to ASTM (American Society for Testing and Materials .)

-Power consumption, kW All motors were 380 – V, 3 – phase. the consumption measured by power meter

RESULTS AND DISCUSSIONS

Feeding rate

The relationship between feeder speed and feeding rate at different opening feed area on feeder when using external line of feeding system as revealed in Fig.1.

It clearly revealed that, the average of feeding rate increased when opening feed area on feeder and feeder speed increased to reach at maximum value with 95 kg/min at 35m/min feeder speed and opening feed area were 36 cm^2.

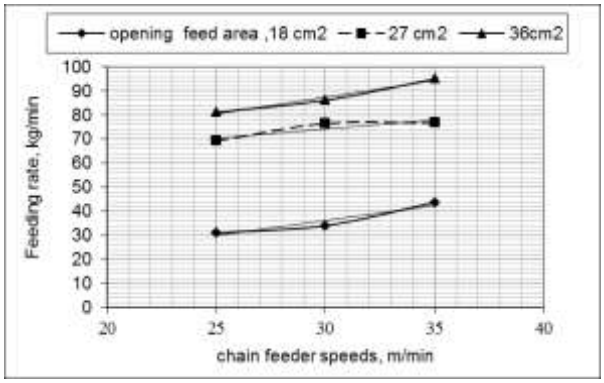

Fig.5. The effect chine feeder speed and the opening feed area on feeder feeding rate
Source: Author determination

Amount of feed on one meter

Fig.6 showing the effect chine feeder speed and the opening feed area on amount of feed on one meter from feeder chain.

The amount of feed on one meter from feeder chain decreased to 490g/m when increased chine feeder speed of 35m/min. at opening feed area were 36 cm^2 while the amount of feed on one meter from feeder chain increased to 1,620 g/m when decreased chine feeder speed to 25m/min. at opening feed area were 36 cm^2.

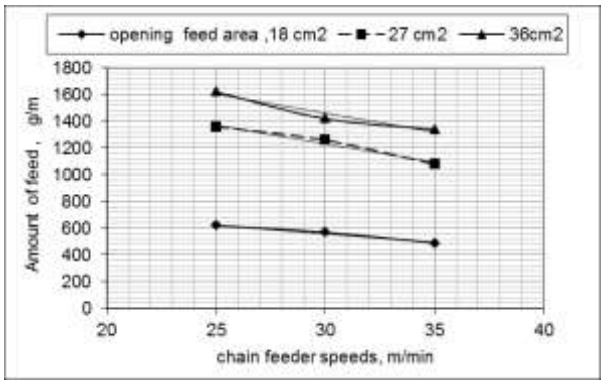

Fig.6. The effect chine feeder speed and the opening feed area on amount of feed on one meter from external feeder chain
Source: Author determination.

The operating time

The chine feeder speed and the opening feed area affected by operating time, the operating time ranged from 6.5 to 16.19 min. when increased the opening feed area from 18 to 36 cm^2 at 30 m/min feeder speed as showing in Fig.7.

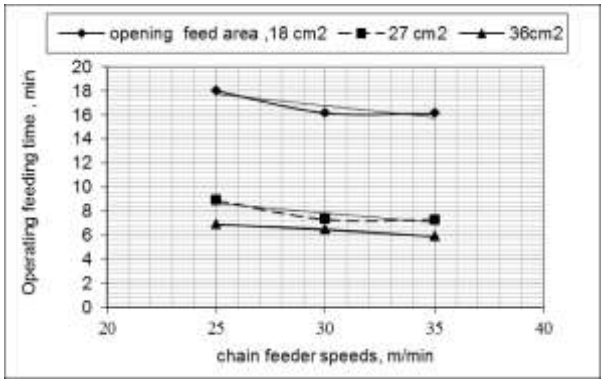

Fig.7. The effect chine feeder speed and the opening feed area on operating time
Source: Author determination.

The feeder efficiency

Fig.8 showing the effect chine feeder speed and the opening feed area on feeder efficiency.

The chine feeder speed and the opening feed area affected by operating time, the operating time ranged from 33.90 to 84.50%. when increased the opening feed area from 18 to 36 cm^2 at 30m/min feeder speed.

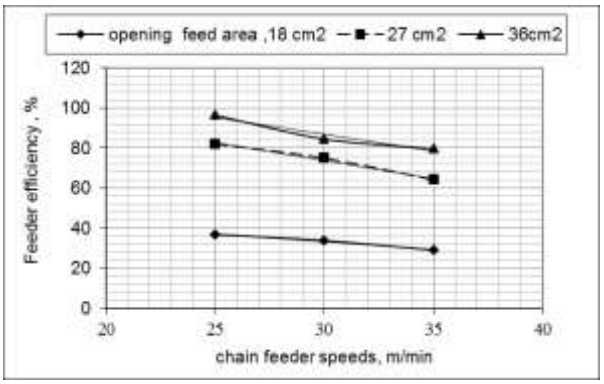

Fig.8. The effect chine feeder speed and the opening feed area on feeder efficiency
Source: Author determination.

The forge losses

Fig.9 and Fig 10 showing the effect chine feeder speed and the opening feed area on forge losses before and after modifying the forge losses decreased from 1,040 to 960, g. before and after modifying at opening feed area were 36 cm^2 and 30 m/min feeder speed.

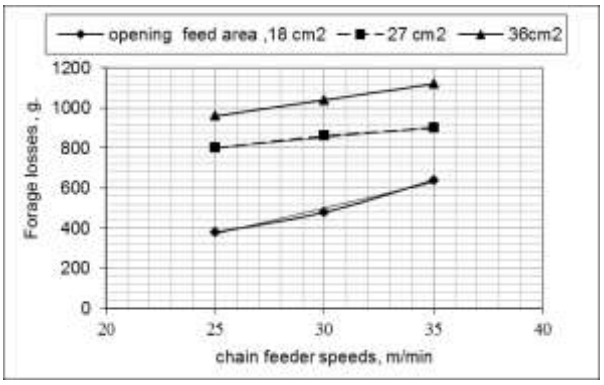

Fig.9. The effect chine feeder speed and the opening feed area on forge losses before modifying
Source: Author determination

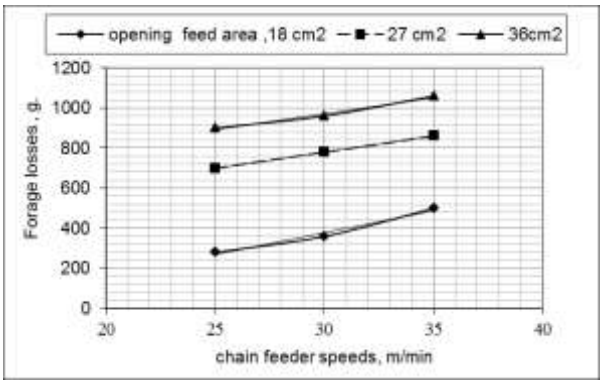

Fig.10. The effect chine feeder speed and the opening feed area on forge losses after modifying
Source: Author determination.

Wearing behaviour

Fig.11 and 12 showing the effect chine feeder speed and the opening feed area on wearing before and after modifying the wearing mass loss decreased from 67 to 26, g. before and after modifying at opening feed area were 36 cm^2 and 35 m/min feeder speed.

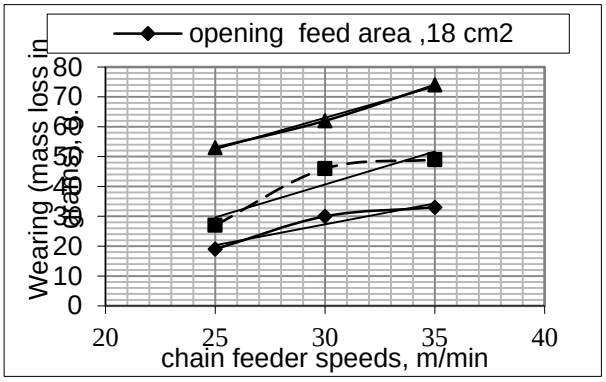

Fig.11. The effect chine feeder speed and the opening feed area on wearing before modifying
Source: Author determination.

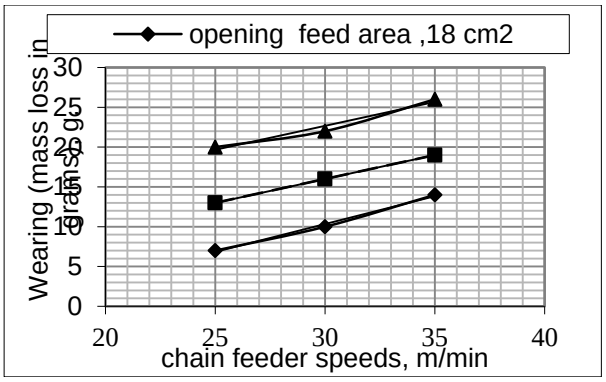

Fig.12. The effect chine feeder speed and the opening feed area on wearing after modifying
Source: Author determination.

The power consumption

Fig.13 and 14 showing the effect chine feeder speed and the opening feed area on power consumption before and after modifying also test power consumption with and without load, the power requirement with ordinary fillers before modified deceased from 1.089 to 0.941 kW with load and without load at 25 m/ min chain speed also deceased from 1.026 to 0.846 kW with load and without load at modified system. The feeder chine loses increased from 280 to 900 g. when opening feed area increased from 18 to 36 cm^2 .

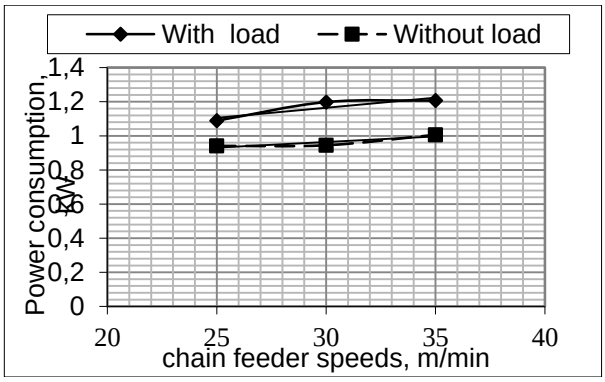

Fig.13. The effect chine feeder speed and the opening feed area on power consumption before modifying
Source: Author determination.

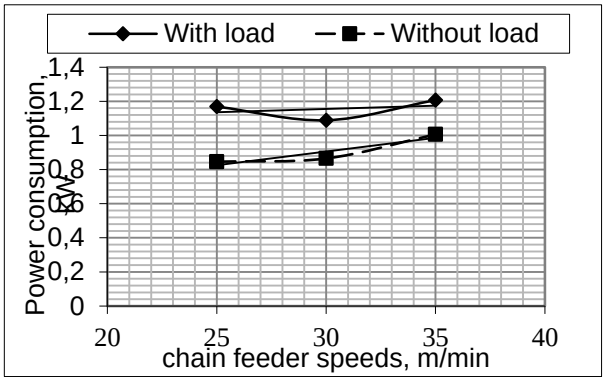

Fig.14. The effect chine feeder speed and the opening feed area on power consumption after modifying
Source: Author determination.

CONCLUSIONS

The main results of the present research can be summarized as follows:

-Using modified feeding system with chain speed.(25-30-35) m/min and opening feed area (18 -27 and 36 cm²). the optimum operating conditions for feeder system with chain speed 30 m/min and opening feed area 36 cm². Using modified feeding system can be

- reduce wearing between corner wheel feeder chine by 61%.
- reduced the average The feeder chine loses by 7.61% .

-reduced the power requirements by an average of 5.78%.

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SOYBEAN SEEDS AND AMBROSIA WEED PHYSICAL PROPERTIES

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Abstract

The experimental work was carried out through 2018 at laboratory of agriculture engineering department, faculty of agriculture Tanta University, Egypt to investigate physical properties of the American soybean seeds and Ambrosia weed were imported to Egypt. These properties can be used in design and development of handling, transporting storage and separating equipment. The seeds dimensions tested under four different moisture content 10, 12, 14, and 16% (wet basis). The results showed, the change in moisture content from 10 to 16% the average dimensions of soybean seeds were changed respectively, the length from 5.60 to 6.57 mm, width from 4.91 to 5.73 mm, thickness changed from 4.11 to 4.73 mm, volume from 62.13 to 96.13 mm^3, geometric mean diameter from 4.83, to 5.62 mm and the arithmetic mean diameter changed from 4.9 to 5.7mm. The differences on sphericity altered from 86.27 to 85.12%. Similarly surface area changed from 21.99 to 29.95 mm^2. Also, the average dimensions of ambrosia weed ranged according imported place the length ranged from 5.20 to 7.53mm, width from 2.46 to 4.00 mm, thickness from 1.57 to 2.97 mm, volume from 11.05 to 41.72 mm^3, geometric mean diameter from 3.10 to 4.70 mm, the arithmetic mean diameter from 3.10 to 4.70 mm, and sphericity from 50.16 to 70.14 %. Also, surface area ranged from 23.9 to 57.99 mm^2. This results revealed the dissimilarities between soybean and ambrosia physical properties that appear in length, width and thickness, this case lead to obstructing separation processes.

Key words**:** *soybean, physical, properties, ambrosia and moisture content*

INTRODUCTION

Soybean (*glycin max*) is one of the main food sources of legume family in human and animal nutrition. which have relatively high protein content in the seeds approximately 40% and oil content 20%. The total production of soybean in the world 334 million tones .and the cultivated area in Egypt was 30,000 ha with total production 45,165 tones according to FAO 2017 [5].

The information about the agricultural products like the physical, mechanical and aerodynamic properties are important and necessary in design of different machines and equipment using for, handling, cleaning, transporting and storage. [1], [3], [10] and [12]

Four different varieties of soybean were determined the physical properties the resulted showed the mean sphericity were 0.745, 0.857, 0.830, and 0.829 respectively. It is shown from the statistical analysis that there is significant difference between the sphericity of all varieties at a probability level of 0.05% The solid densities of all the varieties were ranged from 1,079.5 to 1,170 kg/m^3[7].

The physical and mechanical properties of soybean at 8 to 16% moisture content. In this moisture range, grain dimensions such as length, width, thickness, arithmetic average diameter and geometric average diameter increased from 7.24 to 8.19, 6.79 to 7.12, 5.78 to 6.23, 6.60 to7.18, and 6.57 to 7.14 mm, respectively. The volume of grain and area of grain surface increased linearly from 130.97 to 160.32 and from 125.46 to 144.39 mm2, respectively. The sphericity, bulk density, true density and porosity decreased linearly from 0.91 to 0.87, 766.12 to719.00, 983.33 to 905.67 kg m-3 and 22.58 to 20.61%, respectively. The friction angle increased from 27.37 to 31.81° with the increase of moisture content. The static coefficient of friction increased from 0.385 to

0.571, 0.304 to 0.441 and 0.164 to 0.286 for concrete, wood and galvanized steel surfaces, respectively [6].

Soybean (*Glycine Max*) member from the Fabaceae family, namely it is prone to mechanical damage occurring during threshing, cleaning, drying, storage and transportation,. Information of the physical properties of soybean seeds mainly important for the optimization of harvesting, drying and storing processes, as it translates into minimization of losses and mechanical damage. [9]

Soybean physical properties such as length, width, thickness and thousand mass recorded 6.55 mm, 5.56 mm, 4.53 mm and 103.57 g, respectively, at moisture content of 7.37% (dry basis). When moisture content increased from 7.37% to 15.80% (db) the geometric mean diameter increased from 5.44 to 5.57 mm and the sphericity varied between 0.83 and 0.84 [11].

The influence of moisture content on physical properties (seed dimension, geometric mean diameter, individual seed weight, sphericity, bulk and true density, porosity angle of repose and static coefficient of friction of knotweed (Polygonum cognatum Meissn.) seeds were investigated. Moisture contents of seeds were 7.95, 13.68 and 19.14% d.b. (dry basis), respectively [8].

Common ragweed (Ambrosia artemisiifolia L.) is a competitive weed in soybean fields Ambrosia densities of 2, 6, and 12 m^{-1} row resulted in soybean yield losses of 76, 91, and 95% in 2015 and 40, 66, and 80% in 2016, respectively [4].

Big problem face the separating and cleaning plant in Egypt when imported the soybean a lot of weed similar with seed thus cleaning and separating machine must adjusted to remove all weed. So the main objective of this research to describe the changes between soybean and ambrosia physical properties

MATERIALS AND METHODS

Experiment was carried out through 2018 at laboratory of agric. Eng. dept. Tanta University, to investigate physical, properties of the American soybean seeds imported to Egypt. These properties used in design and development of separating machine of the soybean seeds and ambrosia weed. The seeds and weed dimensions tested under four different moisture content 10,12,14, and 16%

Soybean crops

American soybean seeds as showing in Fig.1 was used in this study, and Ragweed (*Ambrosia Artimesifolia***)** weed seeds as showing in Fig.2.

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Fig.1. American Soybean seeds
Source: Author's own illustration.

Fig.2. Ragweed(*Ambrosia artemisiifolia)*seeds
Source: Author's own illustration.

Measurements and determinations.

-Moisture content

Moisture content soybean seeds was determine as by dried in an oven of 103°C for 24h. All moisture percentages were determined on wet basis as it showed in equations below:

$$M_w = (W_2 - W_1)/W_2 \times 100 \quad (1)$$

where: M_w: Moisture content of soybean seeds sample on wet basis, (%),

W_1: Final mass of soybean seeds sample after drying, (g) and

W_2: Initial mass of soybean seeds sample before drying, (g).

-Axial dimensions of seed

A sample selected 100 seeds randomly. The three axial dimensions of seed are namely length L, in mm (longest intercept), width W, in mm (equatorial width perpendicular to L) and thickness T, in mm (breadth perpendicular to L and W).

- Physical properties

Different physical of soybean seeds were determined. Mean dimensions of soybean seeds, were calculated from this equations:

-Arithmetic mean diameter (D_a), mm:

$$D_a = \frac{(x + y + z)}{3} \quad (2)$$

-Geometric mean diameter (D_g), mm:

$$D_g = (x.\ y.\ z)^{1/3} \quad (3)$$

-Surface area (A_s), mm^2:

$$A_s = \pi., D_g^2 \quad (4)$$

-Volume (V), mm^3:

$$V = \frac{\pi}{6}(x.\ y.\ z) \quad (5)$$

-Sphericity (φ), %:

$$\varphi = \frac{(x.y.z)^{1/3}}{x} = \frac{D_g}{x} \quad (6)$$

where: x: length of grains (mm),
y: width of grains (mm) and
z: thickness of grains (mm)

-Density: $\rho = m/v$ ($gm./cm^3$) (7)

where: m= Mass of sample,(gm.)
v = Volume occupied by the sample, (cm^3).

-Surface area: $S_a = \Pi\ (D_g)^2$ (8)

RESULTS AND DISCUSSIONS

Effect of moisture content on physical properties of soybean seeds.

The values of seed length linearly increased from 5.60 to 6.57 mm with increase moisture content from 10 to 16% (wb) (Fig. 3).

Linear relationship was obtained between moisture content (Mc) and seed length:

$$y = 0.336x + 5.27 \qquad R^2 = 0.9987 \quad (9)$$

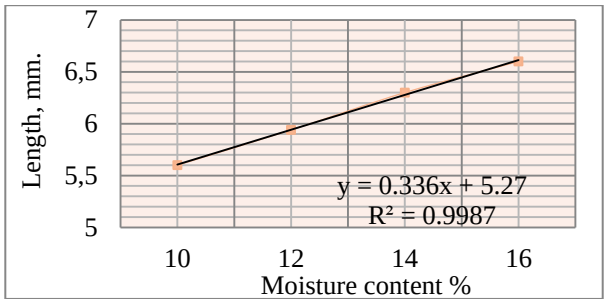

Fig.3.Relationship between moisture content and seed lenght.
Source: Author determination.

The values of seed width linearly increased from 4.91 to 5.73 mm. with increase moisture content from 10 to 16% (wb) (Fig. 4).

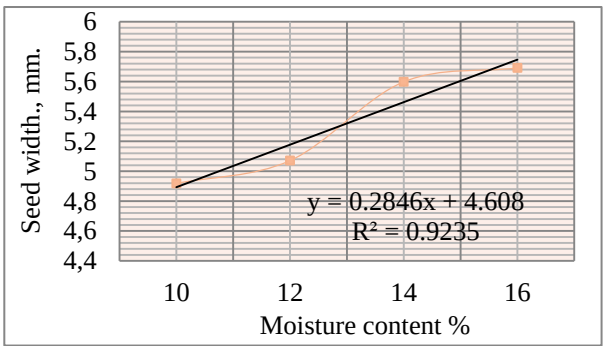

Fig.4. Relationship between moisture content and seed width.
Source: Author determination.

Linear relationship was obtained between moisture content (Mc) and seed width.

$$y = 0.2846x + 4.608 \qquad R^2 = 0.9235 \quad (10)$$

The values of seed thickness linearly increased from 4.20 to 4.65 mm. with increase moisture content from 10 to 16% (wb) (Fig. 5).

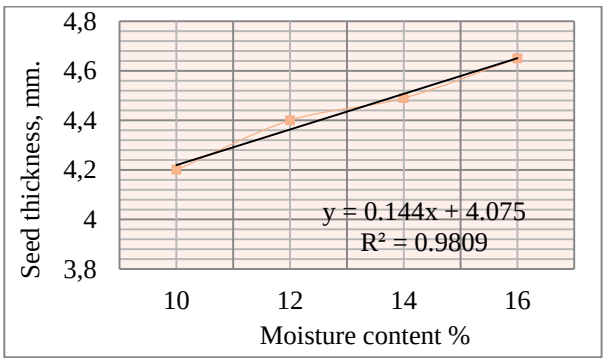

Fig.5. Relationship between moisture content and seed thickness.
Source: Author determination.

Linear relationship was obtained between moisture content and seed thickness

$y = 0.144x + 4.075 \quad R^2 = 0.9809 \quad (11)$

Similar increasing for length, width and thickness of seed, seam trends have been reported for soybean seed. [2] The positive linear relationship of seed width and moisture content were also reported by [11] for soybean. Volume of seed showed linearly increased from 62.13 to 93.90 mm^3 with increase moisture content from 10 to 16% (wb) (Fig. 6).

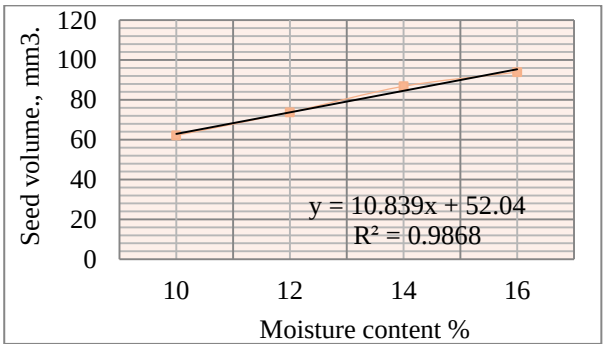

Fig.6.Relationship between moisture content and seed volume.
Source: Author determination.

Linear relationship was obtained between moisture content and seed volume.

$y = 10.839x + 52.04 \quad R^2 = 0.9868 \quad (12)$

Seed arithmetic diameter fluctuated from 4.883 to 5.642 mm. when moisture content increased from 10 to 16% as showing in Fig.7. Linear relationship was ound between moisture content and seed arithmetic diameter.

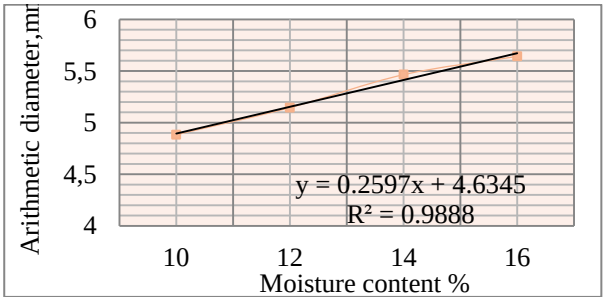

Fig.7. Relationship between moisture content and seed arithmetic diameter.
Source: Author determination.

$y = 0.2597x + 4.6345 \quad R^2 = 0.9888 \quad (13)$

Fig. 8 seed geometric diameter increased from 4.83 to 5.57 mm when moisture content increased from 10 to 16%. Linear relationship was obtained between moisture content and seed arithmetic diameter.

$y = 0.248x + 4.59 \quad R^2 = 0.9984 \quad (14)$

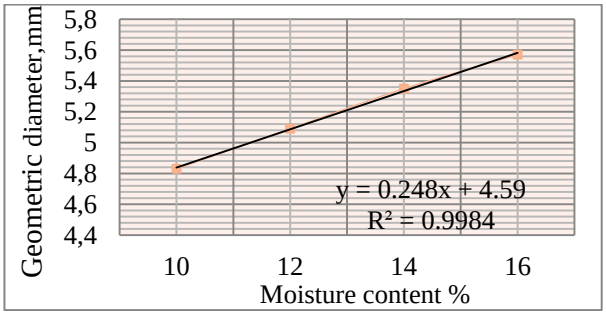

Fig.8.Relationship between moisture content and seed geometric diameter.
Source: Author determination.

Fig. 9 seed sphirecity ranged from 86.27 to 85.12% when moisture content increased from 10 to 16%. Linear relationship was obtained between moisture content and seed sphirecity.

$y = -0.385x + 86.71 \quad R^2 = 0.9852 \quad (15)$

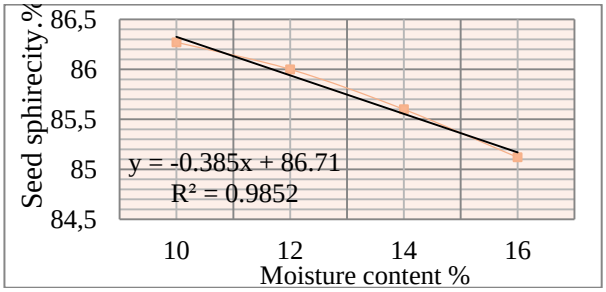

Fig.9. Relationship between moisture content and seed sphirecity.
Source: Author determination.

The result in Fig. 10 indicates that the soybeans flat surface area increased with 21.99, 24.02, 28.19 and 29.71 mm^2 when moisture content increased by 10,12,14, and 16% . The relationship of flat surface area and moisture content can be expressed using regression equation as:

$y = 2.733x + 19.145 \quad R^2 = 0.9686 \quad (16)$

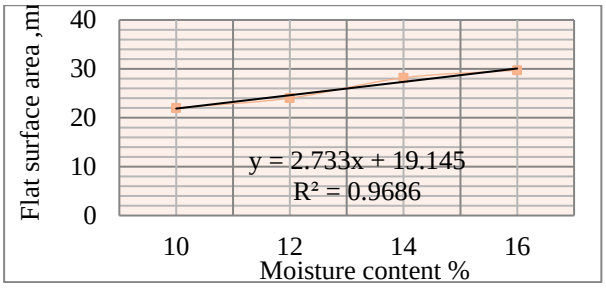

Fig.10. Relationship between moisture content and seed flat surface area.
Source: Author determination.

The transfer surface area of soybean increased by 16.08 17.94 19.98 and 20.96 mm^2 respectively, as moisture content increased by 10, 12, 14, and 16% (Fig.11). The relationship of transfer surface area and moisture content can be expressed using regression equation as:

$y = 1.668x + 14.57 \quad R^2 = 0.9809 \quad (17)$

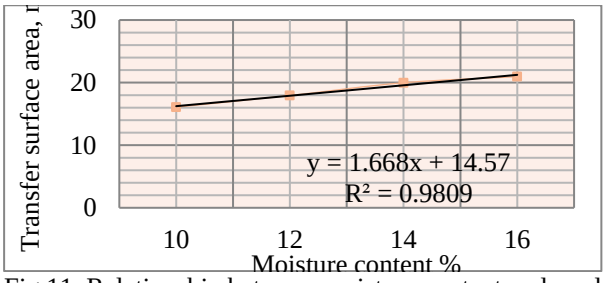

Fig.11. Relationship between moisture content and seed transfer surface area.
Source: Author determination.

The surface area of soybean increased by 73.27, 81.36, 91.5 and 97.42 mm^2 respectively, as moisture content increased by 10,12,14, and 16% (Fig.12).
The relationship of transfer surface area and moisture content can be expressed using regression equation as:

$Y = 8.2602x + 65.238 \quad R^2 = 0.9909 \quad (18)$

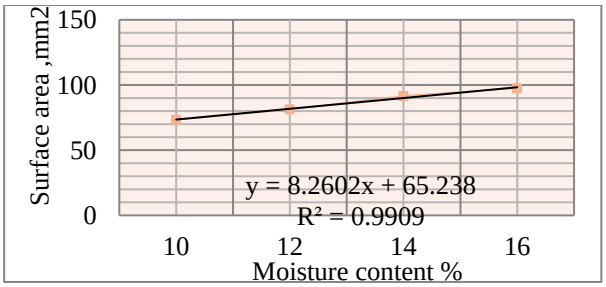

Fig.12.Relationship between moisture content and seed surface area.
Source: Author determination.

Physical properties of ambrosia weed seeds

The average length, width and thickness of ambrosia weed fluctuated from 5.20 to 7.53 to 6.57 mm, 2.46 to 4.00 mm and 1.57 to 2.97 mm also volume ranged from 11.05 to 41.72 mm^3 as maximum and minimum value respectively.
The arithmetic diameter, ranged from 3.10 to 4.70 mm. and geometric mean diameter increased from 2.76 to 4.29 mm.
The surface area increased from 23.9 to 57.99 mm^2 and the sphericity increased from 50.16 to 70.14% with maximum and minimum value respectively. As showing in Table 1.

Table 1. Some physical properties of ambrosia weed seeds

Parameter	Value
Length, mm	5.2-7.53
Width, mm	2.46-4.00
Thickness, mm	1.57 - 2.97
Volume, mm^3	11.05 – 41.72
Arithmetic diameter, mm	3.10-4.70
Geometric diameter, mm	2.76-4.29
Sphericity %	50.16-70.14
Surface area, mm^2	23.9-57.99

Source: Author determination.

The differences between the physical properties of ambrosia and soybean

The average length, width and thickness of ambrosia weed and soybean alternated from 7.53 to 7.62 mm, 6.18 to 4.00 mm and 2.97 to 5.90 mm also volume ranged from 41.72 to 119.00 mm^3 as maximum and minimum value respectively. The arithmetic diameter, extended from 4.70 to 6.20 mm and geometric mean diameter fluctuated from 4.29 to 6.10 mm. The surface area alternated from 57.99 to 35.89 mm^2. At a constant moisture content, 12% as showing in Fig. 13.

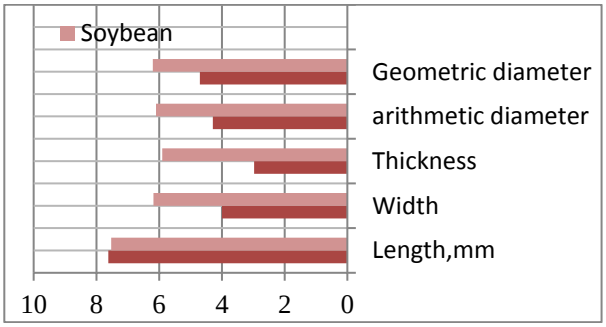

Fig. 13. The differences between some physical properties of ambrosia and soybean
Source: Author determination.

CONCLUSIONS

The soybean grains length, width and thickness change as moisture content ranged from 10% to 16% (wb), the grains length increased from 5.81 to 6.57 mm, width and thickness change from 4.91 to 5.69 mm and 4.11 to 5.53 mm respectively. The geometric mean diameter increased from 4.83 to 5.27 mm. and the sphericity increased from 0.8627 to 0.8512 with the increase in moisture content from 10% to 16% (wb).

The ambrosia grains length, width and thickness recorded value were 6.31 mm, 3.44 mm and 2.29 mm respectively. The geometric mean diameter detailed at 3.66 mm. and the sphericity were 0.5815

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ANALYSIS OF TRADITIONAL FOOD (KHAO YAM) CONSUMPTION IN SOUTHERN BORDER PROVINCE OF THAILAND

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Abstract

Khao yam or Nasi Kerabu is a type of a traditional food, holding an important place in food consumption in Southern Thailand and Northern Malaysia. It is commonly consumed for breakfast and a good source of high nutritional value due to the availability of different varieties of vegetables and herbs in the actual dish. The main material of this study is comprised data obtained from online questionnaire surveys performed during December 2018 with 130 participants from three province borders of Southern Thailand (Pattani, Yala, Narathiwas). One of the preeminent highlights of the study is the availability of Khao yam sellers nearby all of the respondents' homes. This indicates that Khao yam food business in southern part of Thailand is continuously expanding. More researchers and policy makers should take Khao yam business sector as positive source in developing new policies and strategies.

Key words**:** *Khao yam, Nasi kerabu, Street food consumption, Thai cuisines*

INTRODUCTION

Nowadays, Thai cuisines have become an international sensation in food business industry [47]. Since the Thai government has launched "Thai Kitchen to the World Project" from 2004, Thai food business has expanded globally and in ASEAN market [37].

Thai food is known internationally for its unique taste. Historically, the Thai foods that are recognized today is actually a mixed of Indian and Chinese cuisines. It has become one of the most popular culinary products around the world. As a matter of fact, western food consumers ranked Thai food fourth behind Italian, French and Chinese cuisines in respect of ethnic foods [39]. In addition, when the respondents were asked about their most favourite cuisines, Thai food was placed sixth after Italian, French, Japanese, Chinese and Indian foods.

For a number of countries in Asia, rice has been and still remains as traditional staple food [18]. Rice has a thousand of different varieties[2][14][21] and has a lot of different ways to be cook. Rice can be used to make desserts, pastries, and even beverages. Several countries in Asia like Philippines, Japan, Indonesia, Malaysia, Thailand, Cambodia, China, and Korea consume rice as main dish in their meal [34].

Rice being the staple food in these ASEAN countries, it already became part of their way of life, culture, customs and traditions. However, like most of the Asian countries mentioned, Thai people also cannot really eat rice alone. They consume rice as a main dish of their meal together with another kind of dish or a side dish such as, chicken, meat, fish, and veggies [6]. In Southern part of Thailand, one of the traditional foods made up of rice is called "Khao Yam" or "Nasi Kerabu" in Malaysia.

Khao Yam

"Khao" means rice and "Yam" means salad. Khao yam or rice salad is a traditional food from Southern part of Thailand and can also be found in Northern part of Malaysia, particularly in Kelantan, Malaysia [10][40][48]. With a presence of a "yum" in its name which roughly interprets to "mixed" or "tossed" salad, this meal features a assortment of vegetables and Thai herbs

which can be a rich source of fiber and nutrition [25].

In addition to the variety of vegetables and herbs being mixed, the dish contains of cooked rice and distinctive sauce called "Budu" made up from fermented fish. This dressing is an essential ingredient of a delicious Khao yam which adds a salty, sweet and fishy taste in the final product. Khao yam is usually eaten with fried fish or grilled chicken, salted duck egg, fish crackers, chili paste, coconut gravy with fermented fish sauce as well as salad consisting of long bean or four angle bean, cabbage, bean sprouts, toasted coconut desiccate, Vietnamese coriander and ginger torch flower [3]. It is a dish high in nutritional value accented by hints of floral aroma from the presence of many fresh ingredients. Depending on the region, Khao yam is also sometimes eaten along with mango salad and it is very popular as a breakfast dish throughout southern Thailand [19].

The dish has been known about 300 years ago, since Three Southern province borders of Thailand (Pattani, Yala and Narathiwas) and Kelantan of Malaysia was in the same country of Sultanate of Patani. That's why we can find this as traditional food in northern Malaysia and Southern Thailand [30].

Due to being traditional and cultural food, Khao yam has merely turn into a source of income for some people in the region by means of a business. Khao yam can be seen being sold in a small restaurant, business cart or in the street. These days, consumption of street food and fast food has become common, especially in urban area and cities of developing countries [5]. In most of the third world countries, people eating outside of their home are immensely increasing [11][1]. Thus, this study aims to determine the consumption behavior and the opinion of the consumers of Khao yam food from three southern border of Thailand (Pattani, Yala, Narathiwas).

MATERIALS AND METHODS

The research study used comprised data obtained from online questionnaire surveys work, performed during December 2018 with a total of 130 participants from three southern border province of Thailand (Pattani, Yala, Narathiwas). The participants are consumers of Khao yam in different ages, level of education, level of income and from different homelands.

The number of surveys was determined by using the table, generated by the formula used in the determination of the sample volume. The sample volume was determined from the table to be 123 at a reliability level of 95 percent. A total of 130 people were surveyed and selected randomly, 65 male and 65 female. In the survey forms, the questionnaires regarding the demographic information of the participants, their consumption behavior and their opinion of traditional food Khao yam were prepared as close-ended. The SPSS package software was used in the assessment of the survey result [12]. Frequency table, crosstabs and chi-square test were used in the analysis of data.

RESULTS AND DISCUSSIONS

The findings of the study were performed with three steps; (1) Percentage analysis of demographic features, (2) Independent analysis between some of demographic variables and participant's consumption behaviour for Khao yam, and (3) Independent analysis between some of demographic variables and participant's opinion of Khao yam.

(1)Percentage analysis of Demographic Features

Demographic features such as gender, age, education, and income level of the respondents were presented in Table 1.Out of 130 respondents that have been surveyed, half of it (50%) was male and another half was female. Examining the age of the participants, 54 percent of them were 21-25 years old, while 30 percent belongs to 15-20 years old group and 11.5 percent are 26-30 years old. The majority of the respondents (80.8%) were undergraduate students, the rest are master's degree (11.5%) and doctorate (7.7%). It can also be observed that 41.5% of the

participants reported a family income of less than 6,000 Baht, then 28.5% of them were in the 6,001-8,000 Baht, while 7.7% belongs to 8,001-10,000 Baht earner and 14.6% earning more than 12,000 Baht. With regards to the homeland of the respondents, 56.9% of them were from Pattani province, while 23.1% and 20% of them were from Narathiwas and Yala respectively. (Table 1).

Table 1. Demographic Features

Demographic	Group	Frequency (person)	Percent (%)
Gender	Male	65	50.0
	Female	65	50.0
Age	15-20year	39	30.0
	21-25year	71	54.0
	26-30year	15	11.5
	>30year	5	3.8
Education	Under graduate	105	80.8
	Master degree	15	11.5
	Doctor degree	10	7.7
Income	<6,000Baht	54	41.5
	6,001-8,000Baht	37	28.5
	8,001-10,000Baht	10	7.7
	10,001-12,000Baht	10	7.7
	>12,000Baht	19	14.6
Homeland	Pattani	74	56.9
	Yala	26	20.0
	Narathiwas	30	23.1
	Total	**130**	**100.0**

Source: Own calculation.

Table 2 shows the participant's consumption behavior for the traditional food of Khao yam, Base on the answers being produced by the respondents, the results found out that all of the participants were able to eat Khao yam and they were able to buy Khao yam nearby their homes. There are many Khao yam sellers in all Three Province Border Southern Thailand [23]. This indicates that Khao yam is more likely sold in a traditional food or street market.

Thailand is constantly experiencing fast development in modern type of food retailing (supermarkets, hypermarkets and convenience stores) for the last 20 years but still quite maintaining traditional form of fresh market [20][24]. The country's food retailing system comprises of a traditional sector that caters more affordable and traditional food for the consumers [44] and modern retailers.

In Thailand, there are roughly 90,000 street food outlets or food kiosk (Street Stalls/Kiosks in Thailand, n.d.). In 2012, nearly 250 billion THB earning from street food vending was recorded [42]. This result was also supported by Trafialek et al., indicating in his study that Thailand were one of the countries who got highest scores with respect to street food vending sector [43]. This is why the results of the data for the respondents having an access of Khao yam near their home were not surprising. In addition, According to Burke et al., Muslims in particular area of southern Thailand (Songkhla, Narathiwat, Yala, Pattani) were able to afford their necessities and durable goods more than the Buddhist residences [7].

While they always eat Khao yam for breakfast of participants we found that most of them (80.8%) are always eating it for breakfast, while 19.2 percent of them were not always eating Khao yam for breakfast because nowadays there are so many kinds of food to take for breakfast. While the question about eating Khao yam in different times we found that most of them (76.9%) have eaten Khao yam in different times. As we known that Khao yam is a food not just for breakfast, there are so many Khao yam sellers are operating in different times. While the question about the thinking Khao yam is a main food of breakfast we found that 52.3% of them were thinking that Khao yam is not a main food of breakfast because there are so many kind of food for breakfast in that area.

Table 2. Distribution of respondents by age depending on educational level

Consumption Behavior	Yes	Percentage (%)	No	Percentage (%)
1. Are you able to eat Khao yam?	130	100	0	0
2. Is there a Khao yam seller nearby your home?	130	100	0	0
3. Do you always eat Khao yam for breakfast?	105	80.8	25	19.2
4. Have you eaten Khao yam in different times?	100	76.9	30	23.1
5. Do you think Khao yam is a main food of breakfast?	62	47.7	68	52.3
6. Do you know how to cook Khao yam?	96	73.8	34	26.2
7. Have you ever cooked Khao yam at home?	100	76.9	30	23.1

Source: Own calculation.

Mark Wiens have listed the most popular Thai breakfast meal in his website called "eating Thai food". As per common knowledge, Asian countries like Thailand love to eat rice considerably from breakfast, lunch until dinner. There are thousands varieties of Thai dishes, however, only few of them are considered as Thai breakfast or food exclusively for breakfast. Mark Wiens listed Khao yam as the most popular breakfast meal in southern Thailand [45]. Similar to Southern Thai people, Musa et al., reported that fried rice and some other dishes like Nasi kerabu,

nasi empit, and nasi tomato are roughly preferred during breakfast [29].

However, Mar Wiens also added on his blog that Thai people can pretty much eat the same food in breakfast, lunch and dinner. Unlike western people which have specific distinction of food for a certain meal time, most of ASEAN countries do not have their specific distinction.

Moreover, the question about knowing how to cook Khao yam we found that 73.8% of participants do know how to cook Khao yam, then 26.2% of them did not know how to cook Khao yam. While, the question about if ever cooked Khao yam at home we found that 76.9% of them cooked Khao yam at home, and then 23.1% of them never cooked Khao yam at home. Actually, the recipe of Khao yam is not so difficult to make, that's why the majority of consumers can make it by themselves and we can find its ingredients in markets (Table 2).

(2)Analysis Independent between Some of Demographic Variables and Participant's Consumption Behaviour for Khao yam

The Chi-square test for independence, also called Pearson's chi-square test or the chi-square test of association, it is used to discover if there is a relationship between two categorical variables. Chi-square is a versatile statistical test used to examine the significance of relationships between two (or more) variables [8]. In this step, the demographic variables that we prefer to examine are gender and level of incomes with their consumption behaviour for Khao yam by chi-square test.

In the following example, the two variables are "gender" and "consumption behaviour of consumers." The result of Chi-Square test shows that there is significant difference between gender in terms of the question five ($p<0.001$) and the question seven ($p<0.001$). The same result can also be interpreted in the mean that male and female has significant difference in the question "do you think Khao yam is a main food of breakfast" and "have you ever cooked Khao yam at home". Moreover, the result of chi-square test shows that there is no significant difference between male and female in terms of which answer of the question three ($p=0.504$), four ($p=0.582$) and the question six ($p= 0.275$). In other words, the result can be interpreted to mean that male and female has no significant difference for the question "do you always eat Khao yam for breakfast", "have you eaten Khao yam in different times" and "do you know how to cook Khao yam (Table 3).

Table 3. Chi-Square Analysis between Gender and Consumption Behavior

Gender	Consumption Behaviour		Sig.
	3. Do you always eat Khao yam at breakfast?		
	Yes	No	
Male	51	14	0.504
Female	54	11	
	4. Have you eaten Khao yam in different times?		
	Yes	No	
Male	50	15	0.582
Female	50	15	
	5. Do you think Khao yam is a main food of breakfast?		
	Yes	No	
Male	15	50	<0.001*
Female	47	18	
	6. Do you know how to cook Khao yam?		
	Yes	No	
Male	50	15	
Female	46	19	0.275
	7. Have you ever cooked Khao yam at home?		
	Yes	No	
Male	15	50	
Female	47	18	<0.001*

*p=0.05

Source: Own calculation.

In literature, it is projected that 12% to 34% of children and adolescents, frequently miss breakfast, and this percentage is found to upsurge depending on age [41].

In the study conducted by Sampson et al., most of the respondents (79%) were eating breakfast before going to school; however, the results does not show significant difference in the gender of the respondents [33]. Furthermore, Siega-Riz et al. stated on his study that adolescent males are more probable in consuming their breakfast [35]. This statement was also supported by Steyn et al., who reported that males have higher percentage of street food consumption than the females [38]. Sirichakwal et al. also concluded on his study conducted in Bangkok, Thailand that 79% of the students were more likely to eat breakfast [36]. Khao yam food is commonly known as breakfast food in the region.

García-González et al., reported that regardless of age, female are able to get higher proportions than male in terms of cooking ability. She also added that younger people particularly those who were born from 1980s to 2000s revealing more interest in cooking [15]. These results are also positively comparable in the findings of the current study. The same results were also reported in some studies from different countries that women are generally responsible for kitchen and food preparation and basically have higher self-esteem or efficiency in food preparation skills [9][13] [49]. Khao yam food is a simple dish and has no complexity in preparation.

The results of Chi-square test of two variables such as "income" and "consumption behaviour of consumers" is shown in the table 4. The result of Chi-Square test shows that there is significant difference between income and consumption behaviour using the question three (p=0.002) and the question five (p=0.012). The same result can also be interpreted in terms of their mean, that level of income was significant difference for the question "do you always eat Khao yam at breakfast" and "do you think Khao yam is a main food of breakfast".

Table 4. Chi-Square Analysis between Income level and Consumption Behavior

Level of Income	Consumption Behaviour		Sig.
	3. Do you always eat Khao yam at breakfast?		
	Yes	No	
<6,000-8,000฿	80	11	0.002*
8,001- >12,000฿	25	14	
	4. Have you eatan Khao yam in different times?		
	Yes	No	
<6,000-8,000฿	66	25	0.052
8,001- >12,000฿	34	5	
	5. Do you think Khao yam is a main food of breakfast?		
	Yes	No	
<6,000-8,000฿	37	54	0.012*
8,001- >12,000฿	25	14	
	6. Do you know how to cook Khao yam?		
	Yes	No	
<6,000-8,000฿	67	24	
8,001- >12,000฿	29	10	0.557
	7. Have you ever cooked Khao yam at home?		
	Yes	No	
<6,000-8,000฿	66	25	
8,001- >12,000฿	34	5	0.052

*p = 0.05

Source: Own calculation.

However, the result of chi-square test shows that there is no significant difference between the level of income and the consumption behaviour of the respondents in the use of the question four (p=0.052), six (p=0.557) and the question seven (p= 0.052). In other words, the result of the mean can be interpreted as the level of income having no significant difference for the question "have you eaten Khao yam in different times", "do you know how to cook Khao yam" and "have you ever cooked Khao yam at home" (Table 4).

Base on the table 2, when the respondents were asked of the presence of khao yam seller outside or nearby their home, a perfect answer of "Yes" were accumulated from the respondents. This clearly indicates that khao yam was mostly consumed outside homes. However, most of studies in the literature concluded that demographic factors and income as well are not good predictors to identify the consumption pattern of the street food consumers [16][32][38][46]. These findings could support the results of the current study, because Khao yam food like most the variety of street foods are not luxurious food and being consumed by the people regardless of income because of its affordability.

In some studies, it has been reported that consumers with lower income has higher confidence of preparing or making their own food at home[27][31].

(3)Analysis Independent between Some of Demographic Variables and Participant's Opinion for Traditional Food Khao yam

Examining the Participant's Opinion for the Traditional Food of Khao yam, according to the judgements (Table 5), we found that 71.5% of the participants were "agree" of consuming Khao yam because it was economical, then 20% and 8.5% of them "fully agree" and "do not agree" respectively. When the respondents were asked if they find Khao yam tasty we found that most of the participants agreed (96.9%). While, most of the participants believed that Khao yam is beneficial and healthy (fully agree=56.9% and agree=35.4%). Moreover, 52.3% percent of participants were "do not agree" that it is tastier than Kaomok, while 39.2 percent of participants were "agree" that it is tastier than

Kaomok. Kaomok is a one-plate dish. It consists of yellow fragrant rice sprinkled with crispy fried sha8llots and served with a piece of chicken that seems to be baked [3].

Table 5. Participant's Opinion for Traditional Food of Khao yam

Judgements	Fully agree	Agree	Do not agree	Do not agree at all
I consume Khao yam because it is economical	26 (20%)	93 (71.5%)	11 (8.5%)	0
I find Khao yam tasty	48 (36.9%)	78 (60%)	4 (3.1%)	0
I believe that it is beneficial and healthy	74 (56.9%)	46 (35.4%)	10 (7.7%)	0
I think it is tastier than Kaomok	6 (4.6%)	51 (39.2)	68 (52.3%)	5 (3.8%)
I think that it keep me satiated	16 (12.3%)	54 (41.5%)	60 (46.2%)	0

Source: Own calculation.

Moreover, we found that 46.2 percent of participants were "do not agree" that it keep them satiated, while 41.5 percent of them were "agree" that it keep them satiated. If we sum percent of "fully agree" and "agree" it will be 53.8%of participants were think that it keep them satiated (Table 5).

In the following example, the two variables are "gender" and "Participant's Opinion for Traditional Food of Khao yam". According to Table 6, the result of Chi-Square test shows that there is significant difference between genders in terms of which participant's opinion in all of the judgments.

Table 6. Chi-Square Test between Gender and The Opinion for Khao yam

Gender	Participant's Opinion for Traditional Food of Khao yam			Sig.
	I consume Khao yam because it is economical			
	Strongly agree	Agree	Do not agree	
Male	20	40	5	0.009*
Female	6	53	6	
	I find Khao yam tasty			
	Strongly agree	Agree	Do not agree	
Male	16	49	0	0.001*
Female	32	29	4	
	I believe that it is beneficial and healthy			
	Strongly agree	Agree	Do not agree	
Male	30	25	10	0.002*
Female	44	21	0	
	I think it is tastier than Kaomok			
	Strongly agree	Agree	Do not agree	Do not agree at all
Male	0	26	34	5	0.012*
Female	6	25	34	0	
	I think that it keep me satiated			
	Strongly agree	Agree	Do not agree	
Male	0	40	25	<0.001*
Female	16	14	35	

*p=0.05
Source: Own calculation.

The same result can also be interpreted to mean that there is statistically significant difference between the consumption of Khao yam by individuals because "consumed Khao yam because it is economical" (p=0.009), "finding Khao yam tasty" (p=0.001), "believing it is beneficial and healthy" (p=0.002), "thinking it is more tasty than another food" (p=0.012) and the judgment "thinking it keep me satiated" (p<0.001), depending on type of gender that they are male or female.

Table7. Chi-Square Analysis between Income and The Opinion for Khao yam

Income level	Participant's Opinion for Traditional Food of Khao yam			Sig.
	I consume Khao yam because it is economical			
	Full agree	Agree	Do not agree	
<6,000-8,000฿	17	63	11	0.074
8,001->12,000฿	9	30	0	
	I find Khao yam tasty			
	Full agree	Agree	Do not agree	
<6,000-8,000฿	38	49	6	0.040*
8,001->12,000฿	10	29	0	
	I believe that it is beneficial and healthy			
	Full	Agree	Do not agree	
<6,000-8,000฿	50	36	5	0.165
8,001->12,000฿	24	10	5	
	I think it is tastier than Kaomok			
	Full agree	Agree	Do not agree	Do not agree at all
<6,000-8,000฿	6	36	49	0	0.002*
8,001->12,000฿	0	15	19	5	
	I think that it keep me satiated			
	Full agree	Agree	Do not agree	
<6,000-8,000฿	6	35	50	0.001*
8,001->12,000฿	10	19	10	

*p=0.05
Source: Own calculation.

Street food consumption are popular among young men [26][32][4], because of the affordability and availability of street foods among individuals who are students, early workers and traders who are not able to make their own food at home. Atinkut et al., also stated in his study conducted in Thailand that Thai people more likely love to eat street food than in a luxurious restaurant [5]. In addition, Consumers nowadays are very much concern of general food safety risks including environmental, health, and food safety concerns [17][22]. Since, Khao yam comprises different ingredients from different vegetables and fish sauce, Khao yam are considerably a healthy food for the most of the consumers. However, there is no specific consideration on the part of consumers in terms of hygienic preparations.

According to the result of Table 7, Chi-Square test shows that there is a significant difference between the incomes in terms of participant's opinion in judgments number two, four and judgment number five.

The same result can also be interpreted in terms of mean that there is statistically significant difference between the consumption of Khao yam by individuals because "finding Khao yam tasty" (p=0.040), "thinking it is tastier than Kaomok" (p=0.002) and the judgment "thinking it keep me satiated" (p=0.001), depending on level of incomes.

However, the result shows that there is no significant difference between income in terms of which participant's opinion of the judgments number one and three. In other word, the result can be interpreted in terms of their mean that the level of incomes has no significant difference for opinion of the judgments "consumed Khao yam because it is economical" (p=0.074) and "believing it is beneficial and healthy" (p=0.165).

Street foods offer affordability for most of the consumers regardless of income level [26][28].

CONCLUSIONS

Khao yam is a traditional food of southern Thailand and also known as Nasi Kerabu in northern Malaysia, holding an important place as a symbol of breakfast food at the particular region. In this study, Khao yam consumption of those living in the three province border of southern Thailand in different ages, level of education, level of income and different homelands were investigated. Base on the findings demographic factors as well as income and gender cannot be considered as strong determinants to determine the behavioural pattern of the consumers towards Khao yam. Availability of khao yam nearby houses with affordable price has a huge impact on the consumption behaviour of the respondents.

The perfect response from the respondents when asked about the availability of Khao yam nearby their homes was one of the highlights of the recent study. This indicates that Khao yam selling in particular region is continuously growing. However, availability of data from related studies were seems invisible. This can be a variation for many researchers and policy makers out there to widen their experiments scoping the Khao yam food business sector.

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IMPACT OF COCONUT PRODUCTION ON THE ENVIRONMENT AND THE PROBLEMS FACED BY COCONUT PRODUCERS IN LANAO DEL NORTE PROVINCE, PHILIPPINES

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Abstract

Environmental impacts of coconut production may be both positive and negative. Coconut may have a lesser impact on the environment. However, its negative impact may influence the coconut farming of the farmers overwhelmingly. The study was carried out in Lanao del Norte Province in the Philippines from October to November 2016. It was selected purposively for the reason that the majority of the farming activities is from coconut farming particularly in smallholding farming. A total of 400 respondents were interviewed using closed-ended questionnaires. It was felt necessary to identify the impact of coconut production on the environment, the internal and external faced by coconut producers, the factors influencing the coconut yield, and the practices on coconut productions by coconut producers. The study revealed that the severe problems encountered by the coconut producers on coconut production for internal problems were the far distance of the land from farm to market road, intercropping, high cost of laborers, and low and fluctuating price of coconut product for the apparent problems. Furthermore, issues such as pests and diseases, difficulties in nut collections, high transportation expenses in marketing problem, and government taxes for the obvious question were found as severe problems. The regression results revealed that the educational Attainment, size of the land (in hectare), number of coconut tree planted per hectare, the distance of the property from the market road, and the frequency of harvesting nut have a strong influence on coconut production.

Key words**:** *coconut, coconut production, environmental impact, coconut producer, crop, Philippines*

INTRODUCTION

Coconut is a fruit that grows on a coconut tree. It is the seed of the coconut tree. The coconut got its name in the 16th century from the word ‘coco' which means ‘monkey face' [18]. Coconut (*Cocos nucifera* L.) is a monocot belonging to the family *Arecaceae,* subfamily *Cocoideae* and is the sole species of the genus *Cocos* [19]. There are only two significant classifications of coconut such as tall and dwarf [7].

Coconut is one of the most useful palms in the world; every part of the coconut tree has its usefulness. Coconut provides almost of the basic needs of humankind such as food, shelter, medicines, fuel, drink, furniture, decorative materials, cosmetics, and many others. Hence, it is popularly known as "Tree of Life," from the roots to the leaves of the tree are potential raw materials for almost everything [8].

The coconut was introduced in the Philippines by immigrants from the Indo-Malayan archipelago in the early twelfth and thirteenth centuries [10]. Coconut is a smallholders' crop, and a significant proportion of the production is usually consumed locally. Since the Spanish colonialism, coconut serves as the top agricultural crop produced and used as foods by the native Filipinos. Coconut symbolizes the farming life of the Filipino farmers were over 3.5 million coconut producers depend on coconut farming directly or indirectly [8]. The importance of coconut has been surprisingly vital where coconut industry employs more than 3 million coconut producers and workers and to 25 million more

Filipinos working in various coconut-based enterprises throughout the country [17].

Coconut is one of the most important crops grown in more than 93 countries in the world where the main coconut growing areas are located in Asia, Oceania, West Indies, Central and South America and West and East Africa [19]. It is in fact that these countries are dependent on the coconut to some degree either as a source of nutrition, employment, and economic contributor or many times all combined [6]. Philippine is the second largest producer and exporter of coconut all around the world. According to the Philippine Coconut Authority (PCA), 68 out of 81 provinces of the country are coconut areas having 3.517 Million hectares planted to coconut covering about 26 percent of agricultural land and producing 14.902 billion nuts per year [2]. In 2016, coconut areas planted to coconut increased to 1.35% or 3.565 Million hectares [4]. In Northern Mindanao, Region 10, coconut farming is one of the significant sources of income of the coconut producers where it has a share of 12.25 % of the total coconut production in the Philippines [4].

However, trends in coconut production are decreasing due to several factors. Consequently, coconut producers are at a significant disadvantage. They are the producers, but they have the least power over their products. The traders and the processors mostly benefit from the local coconut market profit. Moreover, government policies concerning the industry serve the interest of the powerful exporter processor more than those of the farmers [10]. Despite being part of a multi-billion dollar industry, coconut producer is among the poorest in the Philippines with 60% living at or below the poverty line of 20,000₱ (US$444) per year [1].

On the other hand, several factors have been affecting the farming of coconut producers in coconut production, particularly in the province of Lanao del Norte in Northern Mindanao. The farmers are the poorest within the Philippine agricultural sector and their limited resources, low social protection, low income and limited influence in the network, are slowing down the development of the industry at large. These factors deprived the coconut farming activities of the farmers.

On the other hand, cultivating coconut requires good soil drainage and can adapt to a wide range of soil types [5]. Soil erosion is one of the world's disastrous environmental problems threatening the sustainable development of human beings, particularly the agricultural farming activities of the farmers [24]. One of the surprising importance's of coconut production especially in the production of coconut coir is that it helps restore Mother Nature's beauty and vigor by rehabilitating agricultural lands and preventing erosion of topsoil [9]. However, since coconuts require good drainage, it cannot tolerate flooding or waterlogged condition [5].

Hence, it was felt necessary to identify and discuss the impact of coconut production on the environment, the problems encountered by the coconut producers to understand fully the reasons why despite their significant contribution in the agricultural economy they remain as one of the poorest sectors in the community. The study will also examine the factors influencing the coconut yield of the coconut producer.

MATERIALS AND METHODS

The study was carried out in Northern Mindanao of Philippines particularly in Lanao del Norte Province. The study area was selected purposively for the reason that majority of the farming activities is from coconut farming particularly in smallholding farming and despite the standing of the province in coconut production; the area was reported as one of the poorest regions in the Philippines.

Sampling procedures and sample size

This study involved smallholder coconut producers. In the study area, there was 26,077 total number of coconut producers. It used the stratified random sampling method. Using the stratified random sampling, the populations were divided into three strata based on the

number of districts. Then, the frequencies of each stratum were identified using the number of coconut producers. The total sample size was then estimated using a proportion [22]. The formula was given below.

$$n = Np(1 - p)/(N - 1)(d^2/z^2)+p(1 - p) \quad (1)$$

where:
n is the total sample size, *N* is the total population (*N=26,077*), *p=0.5* (assumed to be the worst-case value, if no estimate of *p* is available prior to the survey), *d* is the accepted error (assumed to be 5%), and *z* is based on confidence level (1.96 for 95%). Using the formula mentioned above, the total sample size found to be 378 [26,077*0.25/ (26,076(0.05/1.96) ^2+0.25)]. Hence, to reach the consistent results a total of 400 sample size was used in the survey. The Proportionate stratified sampling is used when the number of elements from each stratum about its proportion in the total population is selected [13]. Therefore, the samples were selected proportionally to the size of each stratum in the population. The formula used was:

$$n_h = N_h / N * n \quad (2)$$

where:
n_h is the total sample of stratum *h*, *n* is the total sample size (*n = 400)*, *N* is the total population, and N_h is the total population of stratum *h*. Hence, n_1 = 223 (14,541 / 26,077 * 400), n_2 = 137 (8,937 / 26,077 * 400), and n_3 = 40 (2,599 / 26,077 * 400). Simple random sampling (SRS) was applied to determine which municipality to be chosen as the study area. This was used so there were no biases on the sampling procedures. Based on the fishbowl draw Municipality of Bacolod was selected for the first district, Municipality of Munai for the second district, and the Municipal city of Iligan for the lone district.
To reach the objectives of this study, primary data was collected using a closed-ended survey questionnaire. The survey was conducted from October to November 2016 in the study area. The polls used in this study were in English; however, it was translated into a vernacular language which is Visayan dialect so that the respondents were able to understand the questions fully and ready to answer it conveniently. Secondary data were also used for further understanding of the study and the discussion of the impact of coconut production on the environment.

Data Analysis

Quantitative data were analyzed by the assistance of Statistical Package for the Social Sciences (SPSS) version 23. Descriptive characteristics of the coconut producers were presented through frequencies and percentage. For the objectives of this study 5-point Likert scale analysis was administered to describe the level of problems encountered by the coconut producers in coconut production. Respondents were ask to rate the given problems from 1 to 5 point where 1 = Not at all problem, 2 = Minor problem, 3 = Moderate problem, 4 = Serious problem, and 5 = Very serious problem. Percentage and frequency distributions were used frequency also as supporting data.
Also, multiple linear regressions were applied to determine the factors influencing the income of the coconut producers in coconut production. The case model was specified as follows:

$$\text{In } Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} \ldots..+\varepsilon i \quad (3)$$

where:
Y is a dependent variable, which is the annual income of the coconut producers in coconut production. B_0, $\beta_1....\beta_{10}$ = Constants; X_1 (Sex of the respondents); X_2 (Age measured in years); X_3 (Marital status); X_4 (Education); X_5 (Number of coconut trees planted per hectares); X_6 (Size of the land in hectares); X_7 (Type of coconut planted); X_8 (Topography of the land); X_9 (Distance of the land from farm to the market road); X_{10} (Frequency of harvesting nut).

RESULTS AND DISCUSSIONS

Demographic profile of the coconut producers

This section provides the frequencies and ratios of the demographic profile of the respondents (coconut producers) such as age, sex, marital status, educational attainment, and annual income on coconut production (Table 1).

More than half (51.5%) of the coconut producers were female while 48.5% were male. This finding indicates that female coconut producers have more power owning coconut land. However, a study by Khalfan (2015) contradicts this finding in which she found 91% male and only 9% of female were engaged in coconut production [11].

The highest frequency of respondents in terms of age fells into the bracket of 30-40 years old with a total of 138 coconut producers (34.5%) followed by 132 coconut producers (33%) from the bracket of 41-50 years old. Whereas, the lowest frequency of fells into the bracket of lesser than 30 years old with only 41 coconut producers (10.3%). This implies that most of the respondents engaged in coconut production were adult ranging from age 30 to 50 years old.

The study used four categories such as single, married, divorced, and widowed to identify the marital status of the respondents — the survey results that the most significant proportions of the coconut producers were married (83.3%). A small percentage of 6.8% were single, 5.3% were widowed, and 4.8% were divorced. This may be interpreted that married coconut producers are highly dependent on coconut farming for their families. A similar study proved this finding [11].

Almost half (49%) of the respondents had basic education. While 24.8% had a secondary school, 23.8% had no formal training. It can be interpreted that illiteracy of the coconut producers is low. A small ratio of the respondents had finished the higher education level where 2% finished undergraduate school, and 0.5% finished post-graduate school.

The study further revealed that about 41% of the respondents have an annual income of greater than 40,000 Philippine pesos (PHP) followed by 31% of the respondents having a yearly salary between 32,001 to 40,000 PHP. While 15% found to have an annual income of lesser than 24,000 PHP, a small ratio of 12% of the respondents have a yearly income of 24,001 to 32,000 PHP in coconut production. The results imply that the annual income of the coconut producers in coconut production is meager. A similar study revealed that 88.05% categorized to have an average yearly salary of 75,000 PHP [20].

Table 1. Demographic profile of the respondents

Demographic profile		Frequency	Percent
Sex	Male	194	48.5
	Female	206	51.5
	Total	400	100.0
Age	< 30 years old	41	10.3
	30 - 40 years old	138	34.5
	41 - 50 years old	132	33.0
	> 50 years old	89	22.3
	Total	400	100.0
Marital Status	Single	27	6.8
	Married	333	83.3
	Divorced	19	4.8
	Widowed	21	5.3
	Total	400	100.0
Educational Attainment	Primary	196	49.0
	Secondary	99	24.8
	Undergraduate	8	2.0
	Post-graduate	2	0.5
	No formal education	95	23.8
	Total	400	100.0
Annual Income In coconut production	< 24,000 Php	61	15.3
	24,001 - 32,000 Php	51	12.8
	32,001 - 40,000 Php	124	31.0
	> 40,001 Php	164	41.0
	Total	400	100.0

Source: Own calculation.

Geographic profile of the coconut producers

The geographic pattern of the respondents includes the size of the coconut farm, the number of coconut trees planted, type of coconut tree planted, the topography of the land and the distance of the property from the farm to the market road were presented into frequencies and ratios (Table 2).

The Table 2 shows that 37.8% of coconut producers own a coconut farm between 2.5 to 3 hectares while 34.5% own between 1.5 to 2 hectares. It was further shown that the lowest proportion of 11.3% of the coconut producers owns lesser than 1.5 hectares.

Majority of the coconut owners (65.8%) planted more than 150 coconut trees per hectares while the small number of coconut owners (5.5%) planted less than 50 trees per hectares. Of the coconut land own by the coconut producers, it was shown that 48.5% own a plain topography of the property.

While 40.3% own a coconut farm located on the mountainside. A vast majority of the coconut owners (70.3%) own a coconut farm

with a distance of more than 500 meters away from the farm to market road.

Table 2. Geographic profile of the coconut producers

Geographic profile		Frequency	Percent
Size of the coconut farm	< 1.5 hectare	45	11.3
	1.5 - 2 hectare	138	34.5
	2.5 - 3 hectare	151	37.8
	> 3 hectare	66	16.5
	Total	400	100.0
Number of coconut tree planted per hectare	< 50 trees	22	5.5
	50 - 100 trees	43	10.8
	101 - 150 trees	72	18.0
	> 150 trees	263	65.8
	Total	400	100.0
The topography of the land	Plain	194	48.5
	Mountainside	161	40.3
	Rocky ground	25	6.3
	Hilly	20	5.0
	Total	400	100.0
The distance of the land from farm to market road	< 100 meters	12	3.0
	100 - 300 meters	35	8.8
	301 - 500 meters	72	18.0
	> 500 meters	281	70.3
	Total	400	100.0

Source: Own calculation.

Type of the coconut planted

This section identifies the variety of coconut planted by the coconut producers to their land. The recognized two varieties were tall and dwarf. Other natural coconut planted trees were the hybrid and the so-called queen coconut tree.

The Table 3 shows that the majority of the coconut producers (66.5%) planted a tall variety; which is the widely known variety of coconut tree. Only 4.5% of coconut producers planted a dwarf variety. While 18.5% planted coconut tree so-called queen coconut, 10.5% planted a hybrid coconut variety. On the other hand, a parallel study revealed that 51.2% of the coconut producers had planted queen variety of coconut however 32.4% of the coconut producers have planted the tall variety of coconut [25].

Table 3. Type of coconut planted to coconut land

Type	Frequency	Percent
Dwarf coconut	18	4.5
Tall coconut	266	66.5
Queen coconut	74	18.5
Hybrid coconut	42	10.5
Total	400	100.0

Source: Own calculation.

Impact of coconut production on the environment

Literature have revealed that coconut products or by-products have less effect on the environment. It has been established that the coconut palm tree wastes have minimal impact on the environment [16]. Coconut products do not destroy the situation where non-food coco products remain stable in the industrial markets [19]. The demands for soaps, detergents and other cleaning agents and personal care products which used oleo-chemicals are almost unlimited [9]. The husks are generally considered as a waste product, however utilizing this waste can turn into by-products such as rope, mattress filling, and coir [21]. The coir product extracted from coconut husk can helps to restore Mother Nature's beauty and vigor by rehabilitating agricultural lands and prevents erosion of topsoil [9].

Furthermore, production of fiberboards from unripe green coconut coir and fibers may reduce the environmental burden related to husks disposal [14]. It has been reported that the coconut industry globally generated as much as 408,216,000 tons of husks in 2013 [14]. A study has mentioned the variety of environment-related uses of activated carbon produced from coconut shell charcoal [23]. Moreover, this activated carbon can be used in some applications of water purification, gas masks, solvent recovery, and odor control, air purification in closed rooms, wastewater treatment plants and de-chlorination [23].

On the other hand, Coconut crop production results in many environmental aspects, including the use of large volumes of water for irrigation, land use transformation, and fertilizer use [14]. Monoculture farming becomes an issue in areas where coconuts are grown [15]. Growing coconut tree as a mono-crop promotes an environment of low crop diversity that can be damaging to the environment and risky for farmers [3]. As the coconut tree ages, it becomes less productive, and this leads to farmers to plant more coconut trees [15]. Consequently, it leads the farmers to use chemical fertilizers to boost their productivity; hence it can take a significant toll on the soil [15]. Moreover, when chemical fertilizers are introduced, it can be a threat to local biodiversity as well as land, water and air health [15]. It has been revealed in a study that the coconut oil extracted from copra, the dried kernel of the coconut is associated with little environmental pollution [23].

Factors affecting coconut production

This section presents the internal and external factors that affect coconut production in Lanao del Norte. The internal factors will mainly focus on the problems encountered in the production, marketing, management, and labor during the coconut production. On the other hand, government taxes, indiscriminate cutting of coconut trees, the low and fluctuating price of coconut product, coconut monopoly, and natural disasters will be considered external factors.

Production Problems

The findings (see table 4) show that pests and diseases considered by the coconut producers as a severe problem they encountered. It was found by 32.3% of coconut producers that pests and diseases were a serious problem. While 31.5% confirmed it as a severe problem, a small ratio of 4.3% of coconut producers did not confirm as a problem at all. In line with this findings discussed that infestation of pests and diseases were one of the risks that lead to a downgrading of the quality of coconut product like coconut oil and decrease the quantity of the coconut production [18].

A problem in nut collection was also found as a serious problem. This problem was attested by 28.0% of coconut producers as a severe problem while 7.8% did not confirm it as a problem at all. This implies that coconut workers had trouble in collecting the harvested nuts. Hence, it lessens the production of coconut since the accumulated may not be found in the collections of nuts.

The study further shows that infertility of the coconut tree was considered as a moderate problem with 29.0% of coconut producers considered it while at least 15.0% of coconut producers considered the issue as not a problem at all. This is probably because 88% of the coconut producers do not use any fertilizer to help boost coconut productivity [1].

28.3% of coconut producer considered the decline of the coconut tree as a minor problem only. However, 25.8% of coconut producers stated the issue like a severe problem while 6.5% reported it as not a problem at all. It has been revealed in a similar study that old age of coconut palms had a significant contribution towards the low production of coconut yields [11].

On the other hand, the majority of the coconut producers (64.3%) confirmed that infertility of the land did not show to be the problem at all. Only 2.5% and 4.5% indicated the issue like a severe and severe problem respectively. In contrast, other literature showed that low coconut productivity is generally associated with farmers' dependence on inherent soil productivity [5].

Table 4. Level of Problems Encountered by Coconut Producers on Production (n=400)

Problems	Not at all problem (1)		Minor problem (2)		Moderate problem (3)		Serious problem (4)		Severe problem (5)		Mode	Description of the problem
	F	%	F	%	F	%	F	%	F	%		
Pests and Diseases	17	4.3	38	9.5	90	22.5	129	32.3	126	31.5	4	Serious
Problems in nut collection	31	7.8	83	20.8	97	24.3	112	28.0	77	19.0	4	Serious
Infertility of the coconut tree	60	15.0	76	19.0	116	29.0	64	16.0	84	21.0	3	Moderate
The senility of the coconut tree	26	6.5	113	28.3	79	19.8	79	19.8	103	25.8	2	Minor
Infertility of the Land	257	64.3	90	22.5	25	6.5	18	4.5	10	2.5	1	Not at all

Source: Own calculation.

Marketing Problems

The table 5 shows that the coconut producers considered the far distance of the land from the farm to the market road as a severe problem they encountered. This problem was attested by 33.5% of coconut producers while about 10.3% did not consider it as a problem at all. This suggests that the government

should increase its agricultural infrastructures in the province. Farm to market road projects should be the priority to lessen the burdens of the coconut producers in delivering their coconut products to the market area.

32.3% of coconut producers considered high transportation was a severe problem they encountered. While 30.8% of coconut producers found the issue like an acute problem, a small ratio of 5.5% did not consider it as a problem at all. This is probably because the roads in the area are deplorable. A parallel study found high transportation cost not a problem in marketing the coconut [20].

A majority of 43.0% of coconut producers considered multiple channels of distribution of coconut products as a moderate problem. While 27.5% found it as a serious problem, only 3.0% did not think it as a problem at all. It has been observed that the medium of the transportations used by the coconut producers during the coconut production was delivery truck (46.5%), animal cart (26%) (Using *carabao*; a water buffalo, a cow, or a horse), and motorcycle (21.3%). This is in line with a similar study that multiple channels of distribution of coconut products found to be the second-ranked problem encountered in marketing coconut [25].

The findings in table 5 further revealed that the seasonal price variation to be a minor problem. It was considered by about a half of (49.5%) coconut producers. While 11.3% did not consider the problem as a problem at all. Seasonal variation of prices indicated to be one of the problems that existed in marketing coconut found [25]. On the other hand, other similar literature revealed that the unstable price of copra was a severe problem encountered by the coconut producers [20].

Whereas, a vast majority of coconut producers (70.5%) considered that limited market information was not a problem at all. Only 5.3% and 3.5% thought the issue as a serious and severe problem respectively. This finding suggests that coconut producers have important knowledge about the market scenario in the province of Lanao del Norte.

Table 5. Level of Problems Encountered by Coconut Producers on Marketing (n=400)

Problems	Not at all problem (1)		Minor problem (2)		Moderate problem (3)		Serious problem (4)		Very serious problem (5)		Mode	Description of the problem
	F	%	F	%	F	%	F	%	F	%		
Distant distance of the land from farm to market road.	41	10.3	54	13.5	89	22.3	82	20.5	134	33.5	5	Very Serious
High transportation expenses.	22	5.5	65	16.3	61	15.3	129	32.3	123	30.8	4	Serious
Multiple channels of distribution.	12	3.0	30	7.5	172	43.0	110	27.5	76	19.0	3	Moderate
Seasonal price variation.	45	11.3	198	49.5	53	13.3	57	14.3	47	11.8	2	Minor
Limited market information	282	70.5	56	14.0	27	6.8	21	5.3	14	3.5	1	Not at all

Source: Own calculation.

Management Problems

When the levels of the problems encountered in the management aspect were analyzed (Table 6) the study indicates that the problem in intercropping management was a severe problem considered by 29.8% of coconut producers. On the other hand, 25.8% found the problem as not a problem at all. This probably due to the facts that the majority of the respondents do not have a tenant in their land. It has been observed that 41% of the coconut producers hired a tenant to take care of the coconut land. This implies that coconut producers do not want to engage more on intercropping. The main bottleneck in the adoption of optimum management practices in the coconut-based farming system (CBFS) particularly in intercropping is that the small farmers are burdened with substantial costs of production as well as in the marketing of their produces [12]. Further study revealed that coconut producers face insufficient land for intercropping [11].

Moreover, according to the findings of the study, the percentage sharing of income found to be a moderate problem; this was considered by 25.0% coconut producers. While 22.8% and 23.3% of coconut producers felt the issue as a serious and very serious problem respectively, 12.3% did not consider it as a problem at all. This suggests that coconut producer who had hired a tenant on their coconut land had experienced a problem with their tenant with regards to tenancy agreements on sharing of coconut yield.

The problem in coconut sharing of costs and expenses of the coconut production indicated to be a minor problem. While 23.5% of coconut producers considered the issue as a small problem, 13.3% did not think it as a problem at all. It was observed that the traditional practices of coconut producers in Lanao del Norte were the expenses during the coconut productions are shouldered by the owner and the tenant equally. The study revealed that sharecropping was considered by 24.5% of coconut producers as a minor problem. However, 23.3% and 18.5% of coconut producers considered the issue as a serious and very serious problem while 19.5% did not consider it as a problem at all. This may be interpreted that sharecropping is not standard management practices in the province.

The study further revealed that tenure-arrangement on duties and responsibilities was not a problem at all according to 29.5% of coconut producers who considered it. However, while 28.8% considered it as a minor problem a small ratio of 7.0% considered the problems as a very serious problem. This implies that coconut producer has no problem with tenants' performances of duties and responsibilities during the coconut production.

Table 6. Level of Problems Encountered by Coconut Producers on Management (n=400)

Problems	Not at all problem (1)		Minor problem (2)		Moderate problem (3)		Serious problem (4)		Very serious problem (5)		Mode	Description of the problem
	F	%	F	%	F	%	F	%	F	%		
Problems in Intercropping	103	25.8	25	6.3	74	18.5	79	19.8	119	29.8	5	Very Serious
Percentage sharing of income	49	12.3	67	16.8	100	25.0	91	22.8	93	23.3	3	Moderate
Problems in coconut sharing of coconut productions' costs and expenses	53	13.3	94	23.5	80	20.0	89	22.3	84	21.0	2	Minor
Problems in Sharecropping	78	19.5	98	24.5	57	14.3	93	23.3	74	18.5	2	Minor
Tenure-Arrangement on duties and responsibilities	118	29.5	115	28.8	85	21.3	54	13.5	28	7.0	1	Not at all

Source: Own calculation.

Labor Problems

Based on the results in Table 7, it indicates that the high cost of labors was considered by 45.0% coconut producers as a very serious problem encountered. While 27.3% considered the problem as a serious problem a small proportion of 2.3% considered it as not a problem at all. A similar study found that high cost of labors is one of the prime problem faced by coconut producers in Tamilnadu, India [25].

The small duration of work, however, was found to be a moderate problem which 28.8% of coconut producers considered it. While 27.8% considered the problem as a minor problem only 5.8% considered it as a very serious problem. A similar study revealed the same results [25].

Also, the results indicated the problem on unskilled workers was found to be a minor problem and considered by 29.0% coconut producers. On the other hand, while 27.0% considered the problem as an average 15.5% did not consider it as a problem at all. The study further revealed that inadequacy of the coconut workers during the working period found to be a minor problem considered by 27.8%. Only 6.5% did not consider it a problem at all. However, 25.3% and 26.8% of coconut producers considered the problem as a serious and very serious problem. This implies that most of the respondents found the

problem as an alarming problem. A similar study supports this finding that inadequacy of the coconut workers was a prime problem encountered by the coconut producers [25].
Furthermore, a great majority of coconut producers (58.8%) considered the migratory of the workers as not a problem at all while 10.0% and 10.8% considered the problem as a serious and very serious problem.

Table 7. Level of Problems Encountered by Coconut Producers on Labor (n=400)

Problems	Not at all problem (1)		Minor problem (2)		Moderate problem (3)		Serious problem (4)		Very serious problem (5)		Mode	Description of the problem
	F	%	F	%	F	%	F	%	F	%		
High cost of Labors	9	2.3	26	6.5	76	19.0	109	27.3	180	45.0	5	Very Serious
Small duration of work	67	16.8	111	27.8	115	28.8	84	21.0	23	5.8	3	Moderate
Unskilled workers	62	15.5	116	29.0	108	27.0	67	16.8	47	11.8	2	Minor
Inadequacy of workers	26	6.5	111	27.8	55	13.8	101	25.3	107	26.8	2	Minor
Migratory workers	235	58.8	40	10.0	42	10.5	40	10.0	43	10.8	1	Not at all

Source: Own calculation.

External problems
The findings (Table 8) indicated that low and fluctuating price of coconut product was found to be a very serious problem encountered by the coconut producers. Of the total coconut producers, more than a half (52.5%) indicated the problem as a very serious problem while a small proportion of 0.8% reported it as not a problem at all. The government tax imposed by the local government is a serious problem. This finding was considered by 29.0% coconut producers while only 8.0% considered the problem as not a problem at all. The finding suggests that local government should lessen the tax imposed on coconut producers particularly on the smallholder coconut producers.
The findings further indicated that coconut monopoly was a moderate problem encountered by the coconut producers. 29.5% considered this problem as a moderate problem. While 11.0% considered this problem as a very serious problem 14.0% thought it is not a problem at all. Indiscriminate cutting of coconut trees indicated to be a minor problem were 37.5% of coconut producers considered this problem. Of the total coconut producers, only 7.0% thought the problem as a very serious problem while 9.3% viewed it as not a problem at all. Further findings found that natural disasters were not a problem at all where a significant majority (68.0%) of coconut producers considered it. While 12.3% considered the problem as a minor problem, 5.5% and 9.3% considered it as a serious and very serious problem.

Table 8. Level of external Problems Encountered by Coconut Producers (n=400)

Problems	Not at all problem (1)		Minor problem (2)		Moderate problem (3)		Serious problem (4)		Very serious problem (5)		Mode	Description of the problem
	F	%	F	%	F	%	F	%	F	%		
Low and fluctuating price of coconut product	3	0.8	27	6.8	62	15.5	98	24.5	210	52.5	5	Very Serious
Government taxes	32	8.0	76	19.0	97	24.3	116	29.0	79	19.8	4	Serious
Coconut monopoly	56	14.0	98	24.5	118	29.5	84	21.0	44	11.0	3	Moderate
Indiscriminate cutting of coconut trees	37	9.3	150	37.5	101	25.3	84	21.0	28	7.0	2	Minor
Natural disasters	272	68.0	49	12.3	20	5.0	22	5.5	37	9.3	1	Not at all

Source: Own calculation.

Factors influencing the income of the coconut producers

The results revealed in the regression analysis indicate that sex of respondents had no significant influence (p=0.938) on the income of the coconut producers and it had a negative relationship (β =-0.006) to the dependent variable. This result is probably because most of the coconut owners were female.

Age of the respondents indicated no significant influence (p=0.285) on the income of the coconut producers and had a negative relationship to the dependent variable (β=-0.056). This implies that the increase of the age of the coconut producers the income of the coconut producers decreased by 0.056.

The marital status of the respondents showed no significant influence (p=0.392) on the coconut producers' income, but it has a positive relationship (β=0.057). This is maybe because the majority of the coconut producers were married. It implies that family responsibilities matter most.

Table 9 indicated further that the educational attainment of the respondents have a significant influence (p=0.050) on the income of the coconut producers and shows a positive relationship between the dependent variable (β=0.057). This means that additional year of the education by the coconut producers their income on coconut production would increase by 0.057. This result is in line with the study by Khalfan (2015) in which he found that education had a high influence on income [11].

The findings further revealed that size of the land owned by the coconut producers had a high influence (p<0001) on their income in coconut production and showed a more significant relationship to the dependent variable (β=0.452). This finding implies that an increase of the hectare of the land owned by the coconut producers the higher the possibility that their income would increase by 0.452. Literature argued that an increase in the land under improved technologies would increase coconut yield [11].

The number of coconut tree planted to coconut farm indicates a greater influence (p<0001) on the income on coconut production and carries a positive relationship to the dependent variable (β=0.593). Therefore, an increase in the number of coconut trees planted on the coconut farm income on coconut production would increase by 0.593.

When the type of coconut planted to coconut farm was analyzed, it showed no significant influence (p=0.481) on the income on coconut production. However, it has a positive relationship with coconut yield (β=0.035). This is probably because the tall variety is widely planted coconut.

The topography of the land was found to have no significant influence (p=0.080) on the income on coconut production but had a positive relationship to the dependent variable (β=0.089). Based on the demographic results of this study about the topography of the land, the majority of the respondents owned plain coconut land.

Table 9. Results of regression for analysis of factors influencing the income of the coconut producers

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.633	0.274		2.311	0.021
Sex	-0.006	0.081	-0.003	-0.078	0.938
Age	-0.056	0.052	-0.048	-1.071	0.285
Marital Status	0.057	0.067	0.030	0.856	0.392
Educational Attainment	0.051	0.026	0.077	1.969	0.050*
Size of the land (in hectare)	0.452	0.054	0.377	8.425	0.000**
Number of coconut tree planted per hectare	0.593	0.048	0.493	12.413	0.000**
Type of coconut planted	0.035	0.050	0.024	0.706	0.481
The topography of the land	0.089	0.051	0.067	1.758	0.080
The distance of the land from the market road	-0.122	0.049	-0.089	-2.512	0.012**
Frequency of harvesting nut	-0.268	0.063	-0.137	-4.255	0.000**

a. Dependent Variable: Income in copra production

*p ≤ 0.050; **p < 0.0001; R = 0.793; SS = 288.272; MS = 28.827; F = 65.760
Source: Own calculation.

Also, Table 9 also indicated that the distance of the coconut land from farm to market road had a significant influence (p=0.012) on coconut yield, but it had a negative relationship to the dependent variable (β=-0.122). This finding suggests that when the distance of the coconut farm is far from the farm to the market road, the coconut yield decreases by 0.122. This is may be due to the high transportation costs associated with transporting the finished coconut product.

The frequency of the harvest had shown a tremendous significant influence (p<0001) on the income on coconut production, however, shows a negative relationship to it (β=-0.268). This finding suggests that when the nuts are harvested on the early stage, the coconut yield will decrease by 0.286.

CONCLUSIONS

Based on the findings of the study it was concluded that married females dominated coconut producers in the Lanao del Norte. Most of the coconut producers were categorically adult between the ages of 30 to 50 years old. It was further concluded that coconut producers had primary education; however, the illiteracy rate was high. Moreover, the income of the coconut producers on coconut productions found to be low.

Based on the discussion, there are several positive impacts of coconut production on the environment than its negative effects.

The findings concluded that the severe problems encountered by the coconut producers in coconut production for internal problems were the far distance of the land from farm to market road in marketing problem, intercropping in management problem, high cost of laborers in labor problem, and low and fluctuating price of coconut product for external issues encountered. On the other hand, a severe problem was not recorded in the production problems. However, serious issues such as pests and diseases and problems in nut collections were concluded in the production problem. Other pressing issues found were high transportation expenses in marketing problem and government taxes for the apparent problem. Furthermore, moderate issues such as infertility of the coconut tree, multiple channels of distribution, percentage sharing of income, small duration of work, and Coconut monopoly were concluded and considered to be alarming problems.

Also, the regression results revealed that the educational Attainment, size of the land (in hectare), number of coconut tree planted per hectare, the distance of the land from the market road, and the frequency of harvesting nut have a strong influence on coconut production. To address these problems there is a need for the government, non-government organizations, different stakeholders and all actors, in general, to ensure that coconut producers are subjects to adequate land to have greater production and productivity.

Based on the discussions and conclusions of this study the following recommendations were generated and humbly offered.

(i)The governments should provide training and seminars on management of the land and the applications of new technologies on coconut farming like intercropping, fertilizers, seedlings and pesticides that will improve the farming of the coconut producers to increase the coconut yields.

(ii)The government should regulate policies that will control the monopolistic setting of coconut price by the dealers and coconut companies.

(iii)The government must implement a farm to market road and other infrastructure projects to ease the marketing of coconut products.

(iv)The farmers should be encouraged to participate in the programs of the government and be part of the implementation process.

(v)Further research on this study are supported and highly recommended.

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AWARENESS LEVEL OF STUDENTS TOWARDS RURAL TOURISM: A CASE STUDY FROM AZERBAIJAN STATE UNIVERSITY

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Abstract

The aim of this study is to examine the situation of rural tourism in Azerbaijan, its impact on rural development and the rural tourism awareness levels among the students. The research was carried out with 418 students in the Agricultural Economics Department of Azerbaijan State Agricultural University in the academic year of 2018-2019. Data were analysed using SPSS 24.0 statistical software. T-test and one-way analysis of variance, Tukey test was used for the analysis of the independent samples. Research determined that there was no statistically significant difference between the age, school level and monthly total household income variables while the rural tourism awareness level of the students differed significantly according to their gender, place of residence, mother and father occupational status. Students' holiday habits were also examined in the second part and their participation in statements related to rural tourism was analysed in the third part of the research. It is concluded that Azerbaijan has rich rural tourism potential and can be an important source of income if used correctly and will increase employment opportunities. However, it has been observed that there were problems with infrastructure, transportation, promotion and financing in rural tourism and that the work of the Ministry of Tourism was insufficient. Communication and cooperation between the institutions affiliated to the Ministry were weak. Rural tourism has been accused of accelerating cultural change and environmental problems.

Key words: *rural tourism, alternative tourism, Azerbaijan, university students, ecological tourism*

INTRODUCTION

Tourism serves an important role in the economic development of every country. Various activities from tourism sector produce more jobs, reduce poverty and promote development in the local economy of the country. Accordingly, the rapid development of rural tourism has been observed in the most region of the world including areas in animal husbandry, folk art and historical artifacts. The unique feature of this type of tourism is that all the necessary resources for tourists are found in the countryside [3].

In rural tourism, tourists are in contact with nature for some time and have the opportunity to experience all aspects of rural life such as local people's way of living, local folklore, traditions, and rural festivals [16].

In the study carried out by European Union (EU) rural tourism is defined as "Activities that are carried out in small settlements, including small enterprises providing accommodation, food drinks and other services to tourists whose aim is to unwind and to have a good time with the agricultural or local values" [24].

The participation rate in rural tourism is increasing year by year. Alongside, rural tourism which takes place in the countryside has started to develop in a very wide area, instead of being limited to certain seasons and activities which only promotes natural beauties [1].

In the World Tourism literature, rural tourism is described with different names, such as farm tourism, village tourism, highland tourism, agricultural tourism and eco-tourism. Rural tourism is expressed in so many different ways because of the lack of common consensus on the scope of rural tourism. [7] [16] [17].

Rural tourism can be described in a simple manner as "Type of tourism which is carried out in rural areas" [18]. According to another common definition, rural tourism is a multi-purpose journey to rural areas with relatively untouched ecosystems that directly contribute to the solution of problems in rural areas and are subject to sustainable development based management [20]. Hence, according to a more comprehensive definition "Rural tourism includes various activities, services and facilities to attract tourists to their regions in order to generate more income for the businesses put up by the farmers and villagers" [12].

Today, the ultimate goal of rural development is to improve the quality of life of rural people [6]. One of it`s most important duties is the economic development of the village and the countryside together with the dynamic growth of the country's economy. First of all, it is necessary to reduce the migration of the local people into the cities, especially the young population and solve the differences between the living standards of the urban and rural population. The tourism industry can contribute greatly to the development of rural areas. In fact, one of the promising areas for the development of the tourism industry is rural tourism [3][13].

Thus, internal migration is not the only reason why economies shift to rural tourism for rural development. The aim is often to attract more intense pressure on coastal tourism to rural areas or to create new opportunities by evaluating the potential of the available resource in rural areas due to the limited nature that can be offered in the coastal regions [23].

People living in rural areas normally have low incomes, poor working conditions, high unemployment rate and more seasonal jobs. The rural community has naturally increased its interest in rural tourism, which creates an additional source of income for them. The main objective here is to help balancing the distribution of revenues throughout the year among rural communities and the country's economy. Undoubtedly, the welfare of the rural population has a positive effect on the welfare of the country [5][21].

Therefore, it is necessary to separate the negative and positive effects of rural tourism on the natural environment and examine them separately. At first, the people of the region will possibly be affected as tourism leads to the development of rural infrastructure. Furthermore, after the village lands will be open for tourism, people living in this area will exert more efforts to protect the natural environment of the land after the understanding the negative effects of a dirty environment on village tourism[22].

Rural tourism creates various socio-cultural influences in every individual and the society such as changes in value systems, personal behaviors, family relationships, common living styles, security levels, ethics, traditional ceremonies and social organization[19].

Although, positive and negative effect of tourism on nature and socio-cultural environment are factual. Rural tourism is the most supportive of nature and environment protection. In addition, preservation of nature and cultural heritage is essential for the sustainability of rural tourism [19]. In order to prevent and save the deterioration of the existing natural environment in Europe, the tourists accepted to the villages is limited to specific count and the intensity of the transitory tourist is tried to be prevented [25].

Purpose of the research

In this research, answers to the following questions will be searched.

(i)Is the rural tourism awareness level of students significantly different from gender?

(ii)Does the level of rural tourism awareness of students show a significant difference according to age, school level and monthly household income?

(iii)Does the level of rural tourism awareness of students show a significant difference according to the place of residence?

(iv)Does the level of rural tourism awareness of the students differ significantly according to the parent's occupation?

(v)What are the existing holiday habits of students?

(vi)What is the level of rural tourism awareness of students?
(vii)What do students think about the impact of rural tourism on the environment and cultural structure?

MATERIALS AND METHODS

In this study, the questionnaire was accepted as data collection tool and the scale developed by Doğan and Üngüren was adapted in doing the hypothesis of this research [4]. There are 29 questions in the survey and the questionnaire is consists of 3 sections. In the first part, demographic questions such as gender, age, school level, place of residence, parents occupation were included. The second part of the questionnaire contains 5 open-ended questions, one of which includes students' holiday habits. The last part of the questionnaire consists of 18 opinions from students' perceptions and levels of awareness about rural tourism. These opinions: 1=Strongly Disagree – 5=Strongly Agree was prepared using five-point Likert Scale. The main mass of the research is composed of the students from 1st, 2nd, 3rd and 4th year of the Agricultural Economics Department in the Agricultural State University of Azerbaijan.

The questionnaires were given to the students in the class and it was carried out on 19th-23rd of November 2018 under the supervision of the instructor. A total of 418 students were targeted. It was determined that 18 of the questionnaire forms obtained from the questionnaire applied to 418 students studying in the department were incomplete and incorrectly filled and therefore not taken into consideration. As a result, it was observed that 400 questionnaire forms were suitable for statistical analysis and were evaluated.

For the reliability of the questionnaire, Cronbach`s Alpha reliability value was found to be $\alpha = 0.70$ and it was accepted that the data were reliable. The data were analyzed with the help of SPSS-24 (Statistical Package for the Social Sciences) program.

Data analysis

Firstly, Shapiro-Wilk test was applied to determine whether the data were abled to show normal distribution. When interpreting the results, the significance level was accepted as 0.05 and the data were found to be normal ($p = 0.603$). Since the normal distribution was determined, parametric tests were preferred. One-way analysis of variance (ANOVA) test was used to analyze whether there was a statistically significant difference among the variables that are used; such as students' place of residence, school level, monthly household income, parents occupation, perceptions about rural tourism and levels of participation in expressing their (students) awareness.

Tukey HSD test was used to determine the source of this difference in the cases where there were differences in the result of the test. Independent samples t-test was applied to determine whether there was a statistically significant difference between the students' gender variable with their perception of rural tourism and their level of participation in expressing their level of awareness.

The findings were evaluated at 95% confidence interval and 5% significance level.

RESULTS AND DISCUSSIONS

Students' Demographic Characteristics

Table 1, gives information about the demographic characteristics of the students participating in the survey.

The gender distribution of the respondents were observed to be 61% male and 39% female.

It can also be observed that 30% of the respondents was taken in the first year, 30% in the second year, 31.25% in the third year and only 8.75% in the fourth year level.

When the distribution of students according to their places of residence was examined, it shows that 18.8% of the students reside in the village, 13.5% of them live in the town and 67.8% of them live in the city.

When we look at the age ranges of the students, 20% are 18 years old and younger, then, 40% belong to 19-20 age range, 32.5% in 20-21 age range, 23-24 age range comprises only 4.5%, while 25 years and older got the lowest contribution of only 3%.

Table 1. Demographic characteristics of the respondents

Variables	Groups	n	%
Gender	Male	244	61
	Female	156	39
	Total	400	100
Age range	≥18	80	20
	19-20	160	40
	21-22	130	32.5
	23-24	18	4.5
	25≤	12	3
	Total	400	100
Class	1st year	120	30
	2nd year	120	30
	3rd year	125	31.25
	4th year	35	8.75
	Total	400	100
Place of residence	Viallage	75	18.8
	Town	54	13.5
	City	271	67.8
	Total	400	100

Source: Own Calculation.

Levels of awareness on rural tourism among students based on their gender.

In the research, the rural tourism awareness levels of the agricultural economics students were examined first in terms of gender distribution. T-test was performed in order to determine whether there was a significant difference between the two variables. According to the results of the analysis in Table 3, there was a significant difference between the respondents' gender and the level of awareness on rural tourism (t(398) = -2.976, p = 0.003). The rural arithmetic mean of males is ($\bar{x}$=69.91), while the female students is ($\bar{x}$=72.87). This finding shows that the level of perception and awareness of female students about rural tourism is higher than that of the male students.

Table 2. T-test analysis of gender variable and rural tourism awareness levels.

Gender	N	Mean	Std.D	df	T	Sig.
Male	244	69.91	9.60	398	-2.976	0.003*
Female	156	72.87	9.85			

*p<0.05

Source: Own Calculation.

In related literature, Çuhadar and Unalın stated in their research that there is a significant difference between the students' gender and rural participation level about the perception of rural tourism among the undergraduate tourism students (p = 0.008 <0.05)[2].

In line with research of Cuhadar and Unalın, the findings of the study indicate that the levels of rural tourism awareness of the students are differentiated according to their gender.

Levels of rural tourism awareness among students according to their age, school level and monthly household income variables.

One-way analysis of variance (ANOVA) was performed to determine whether there was a significant difference between rural tourism awareness levels among students with their age, school level and monthly total household income variables. The results are presented below.

Table 3. ANOVA test of the difference between the level of awareness of students towards rural tourism according to age, school level and monthly total household income variable.

		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	889.25	4	222.31	2.351	0.054
	Within Groups	37349.93	395	94.56		
	Toplam	38239.18	399			
Class	Between Groups	300.62	3	100.21	1.046	0.372
	Within Groups	37938.56	396	95.80		
	Toplam	38239.18	399			
Monthly total household income	Between Groups	572.97	4	143.24	1.502	0.201
	Within Groups	37666.21	395	95.36		
	Toplam	38239.18	399			

Source: Own Calculation.

As a result of the analysis, no significant difference was found between the age ($F_{(4-395)}$=2.351; p= 0.054>0.05), school level ($F_{(3-396)}$=1.046; p=0.372>0.05) and monthly total household income ($F_{(4-395)}$=2.351; p=0.201>0.05) variables of the students. This finding can be interpreted that the variables do not have an effect on students' opinions and ideas about rural tourism.

Çuhadar and Unal found in their research about perception on rural tourism among Tourism undergraduate students that there was no statistically significant difference between the level of awareness and the year level they were currently attending [2]**.** The levels of rural tourism awareness of students do not differ according to their year level in school. The present research findings are in line with the findings of the study conducted by Cuhadar and Unal.

Levels of rural tourism awareness of the students according to their place of residency.

One-way analysis of variance (ANOVA) was conducted to determine whether there was a significant difference between rural tourism awareness levels and place of residence variable of Agricultural Economics students (Table 4).

Table 4. ANOVA and Tukey test results of The level of awareness of students on rural tourism according to their place of residence.

Variables					N	X̄	Std.D
(1)Village					75	68.47	9.50
(2)Town					54	74.37	10.96
(3)City					271	71.13	9.45
Total					400	71.07	9.79
	SS	Df	MS	F	Sig.	difference (Tukey)	
BetweenGroups	1097.44	2	548.72	5.865	0.003*	1-2	
Within Groups	37141.74	397	93.56				
Total	38239.18	399					

*p<0.05

Source: Own Calculation.

According to Table 4 ($F_{(2\text{-}397)}$=5.865, p=0.003<0.05), it is determined that the place of residence makes a meaningful difference in terms of students' awareness of rural tourism. Post-Hoc-Tukey test was used to determine the source of this difference. According to the results of the test, there was a significant difference between the mean scores of the students living in the village ($\bar{x}$=68.47) and those who live in town area ($\bar{x}$=74.37) in terms of their level of awareness about rural tourism. This result can be interpreted as the students residing in the town are more being conscious than those of the students residing in the village. Çuhadar and Unal also found in their study that there were no statistically significant differences between the distribution of participation of the respondents [2]. As a result, the recent findings acknowledge the study conducted by Çuhadar and Unal which showed that the level of rural tourism awareness of the students differed according to their places of residence.

Level of rural tourism awareness of the students according to the parent's occupation.

The results of ANOVA and Tukey tests was presented in Table 5, to determine whether there is a significant difference between the level of rural tourism awareness of the students from the Department of Agricultural Economics and their father's profession.

Table 5. ANOVA and Tukey test results for the difference between the fathers' occupation and the level of awareness of students towards rural tourism.

Variables					N	Mean	Std.D
(1)Farmer					37	70.03	7.53
(2)Officer					67	67.79	10.01
(3)Worker					188	71.80	9.93
(4)Artisan					60	72.00	9.01
(5)Retired					48	72.42	10.68
Total					400	71.07	9.79
Varyans kaynağı	SS	df	MS	F	Sig.	difference (Tukey)	
Between Groups	999.14	4	249.79	2.649	0.033*	2-3	
Within Groups	37240.03	395	94.28				
Total	38239.18	399					

*p<0.05

Source: Own Calculation.

According to the results of the Post Hoc Tukey test ($F_{(4\text{-}395)}$=2.649, p=0.033<0.05), it was determined that the father's occupation has a meaningful difference in terms of students' awareness about rural tourism. According to the results of the test, a significant difference was found between the students whose fathers were civil servants ($\bar{x}$=67.79) and the students whose fathers were workers ($\bar{x}$=71.80). This result can be interpreted that the students whose fathers are workers are more knowledgeable about rural tourism.

Table 6. ANOVA and Tukey test results for the difference between the mothers' occupation and the level of awareness of students towards rural tourism.

Variables					N	Mean	Std.D
(1)Housewife					223	72.26	9.67
(2) Officer					37	66.14	9.54
(3) Worker					120	71.47	9.38
(4) Artisan					8	67.00	11.81
(5) Retired					12	62.92	7.28
Total					400	71.07	9.79
	SS	df	MS	F	Sig.	difference (Tukey)	
Between Groups	2163.64	4	540.91	5.923	0.001*	1-2 1-5 2-3 3-5	
Within Groups	36075.54	395	91.33				
Total	38239.18	399					

*p<0.05

Source: Own Calculation.

Using the same test as the previous variables, when we look upon the results ($F_{(4\text{-}395)}$=5.923, p=0.001<0.05), The mothers' occupation also has a meaningful difference in terms of the level of awareness of the students. According to the Tukey test, it was found that the students whose mother are housewives ($\bar{x}$=72.26) are more concious about rural tourism than those whose mother are civil servants ($\bar{x}$=66.14) and retired ($\bar{x}$=62.92). When we look at the mean result, a significant difference was found in favor of the students

whose mothers are workers ($\bar{x}$=71.47) than those whose mothers are civil servant ($\bar{x}$=66.14) and retired ($\bar{x}$= 62.92).

Current holiday habits of the students from Agricultural Economics Department

In the second part of the questionnaire, five questions were asked, one of which was open-ended, in order to understand the students' holiday making habits and their awareness about rural tourism.

The students were asked whether they do a regular holiday and 52% said yes while 48% stated they don't. Meanwhile, when the students were asked what was the important thing to do during the holiday, 41.5% answered "to relax and to have fun" and nearly a quarter (24.8%) of the respondents said "seeing new things". Then, respectively, 16% stated "to visit families and relatives", 11.3% said "to learn new cultures" and only 6.3% answered, "to adopt new hobbies". When the question on what tourism activities they have participated so far was raised, 37.8% of the respondents answered "nature tourism", 26.3% water tourism, 12.8% mentioned "agricultural-based tourism".

However, when the students were asked what are the activities they know in rural tourism, the responds' percentage was quite low. Some of the students were either had not answered or gave an incomplete respond. After the elimination of inadequate responses, the remaining answers were grouped and four categories were obtained. 43.8% of the students answered this question as for nature activities, 18% as economic activities, 8% as agricultural activities and 5% as cultural activities. Most nature activities include rural tourism activities. In fact, 43.8% of the students answered "nature activities" to the question of what are the activities of rural tourism. Indeed, Nature activities include rural tourism but are more extensive and not all activities in nature are defined as rural tourism. It is observed that the students recognized the nature activities and rural tourism as the same. In addition, rural tourism activities are perceived only as agricultural activities in villages. Almost half of the students perceive nature activities as rural tourism activities and 8% of them anticipated it as agricultural activities.

Level of awareness on rural tourism among the students of the Department of Agricultural Economics

Table 7. Students' opinion on rural tourism and their level of participation in these statements (n=400).

Opinions	F					Average	Std.S
	1	2	3	4	5		
Qualified labor force is needed in rural tourism.	27	29	14	125	205	4.13	1.20
The development of transportation facilities in Azerbaijan is important for rural tourism.	29	28	26	139	178	4.02	1.20
Investments need to be increased in order to develop rural tourism in Azerbaijan.	44	17	16	156	167	3.96	1.27
Rural tourism can be an important source of income in Azerbaijan.	11	61	37	128	163	3.93	1.16
Azerbaijan has rich potential in the field of rural tourism.	15	49	37	169	130	3.88	1.11
Rural tourism changes the cultural structure of the people living in the region.	35	19	61	170	115	3.78	1.17
I think that rural tourism will produce more employment opportunities in Azerbaijan.	44	50	57	156	93	3.51	1.28
Financing opportunities for rural tourism are limited.	45	75	56	117	107	3.42	1.35
Through rural tourism, I believe that women living in the countryside of Azerbaijan will be strengthened.	36	40	98	177	49	3.41	1.11
Environmental problems are increasing in rural tourism-concentrated regions.	42	52	103	146	57	3.31	1.18
People and all sectors must participate in the success of rural tourism.	43	70	94	122	71	3.27	1.25
The people of Azerbaijan pay enough attention to rural tourism.	47	103	109	95	46	2.98	1.20
The presentation of the natural cultural richness of Azerbaijan is sufficient.	92	97	72	78	61	2.8	1.39
There are sufficient and effective cooperation and communication between the main organizations and units of the province for the development of rural tourism in Azerbaijan	85	157	66	68	24	2.47	1.17
Azerbaijani people are aware of rural tourism.	102	150	60	71	17	2.38	1.17
Rural tourism can only be successful through the efforts of the Ministry of Tourism.	127	130	67	29	47	2.35	1.31
There are no significant infrastructure problems in the rural tourism of Azerbaijan.	84	191	61	47	17	2.31	1.06
Specialized travel agencies dealing with the types of rural tourism are sufficient.	127	154	72	30	17	2.14	1.08

1: Strongly disagree 2: Disagree 3: Undecided 4: Agree 5: Strongly Agree
Source: Own Calculation.

One of the most important goals for Azerbaijan is to minimize the dependence of the economy on oil and to ensure the

economic development of rural areas. Hence, one of the tasks that need to be done is the development of rural tourism. There are 4,260 villages in Azerbaijan. The development of rural tourism is of great importance in the villages on the highland and foothills, in order to provide additional income to the people working in the agricultural sector. There are geographic and climatic conditions that need to be considered to develop rural tourism in many regions of the country. These regions are surrounded by high mountains, beautiful forests, mountain rivers, and waterfalls. Nature together with rich food culture makes these regions more attractive and important. However, a very small share of the current potential is used [11]. 74.8% of the students confirm that Azerbaijan has rich rural tourism potential ($\overline{x}$=3.88).

Austria is a country with an area of 83,000 square kilometers in Central Europe. The population is almost equal to the population of Azerbaijan. However, Austria's annual tourism income is over $ 20 billion. Another example is Norway, an oil country. The country's oil production is twice than Azerbaijan. However, their annual income from tourism is over $ 6 billion. According to Norwegian scientists, the income provided by a tourist to the state is higher than the income from 3 tons of oil sales. Generally, tourism and one of its type "rural tourism" potential can be an important source of income for Azerbaijan in the future. As a sign of being aware of this situation, the students showed a participation rate of 72.8% ($\overline{x}$=3.93).

There are several approaches to the development of rural tourism in the regions. One of them is the activities carried out by the local people for the development of rural tourism without any support from the government. However, it is not legally and economically possible for these services provided by the local people to be met by the state. Rural tourism cannot be a profitable area unless basic infrastructure problems are solved. The second and most realistic option is the implementation of state programs and investments for rural tourism in addition to private enterprises for the development of this area. Such issues can only be solved by the state not by any individuals and it require large investment. [9]. 80.8% of the students agreed in the idea of increasing investments for the development of rural tourism ($\overline{x}$=3.96). This high compliance is an indicator of the fact that students agree that rural tourism investments are a very important factor in the development of rural tourism.

Financing opportunities should be provided for rural tourism investments. In Azerbaijan, participation in the statement that the financing opportunities required for the development of rural tourism are limited is high ($\overline{x}$=3.42). Students believe that these funding opportunities are insufficient due to the economic situation of Azerbaijan. This belief also manifests itself in students' high participation in this question.

The transport system is an important factor for the country's tourism sector. In Azerbaijan, the transportation network usually connects the big cities to one another and is insufficient to connect the rural areas to one another. More effort is needed to solve the transportation problem. 79.3% of the students thought that the advanced transport system was important for rural tourism ($\overline{x}$= 4.02). The high level of participation of students in this statement is an indicator of the awareness of these problems in the transportation area and the fact that transportation is an indispensable part of rural tourism.

The purpose of rural tourism is to increase the welfare level of the villages, to reduce unemployment and to ensure the work of women and young people in rural areas. Unemployment in the countryside, especially among women and youth are still a huge problem. About 50% of the population in Azerbaijan lives in villages. The percentage of students who think that the development of rural tourism will increase the employment opportunities of the country in the future is 62.3% ($\overline{x}$= 3.51).

It is very important to have educational institutions which will train qualified labor force for rural tourism in the country and to give lessons about rural tourism in these institutions and to prepare rural tourism

component for the future. In order to ensure the preparation of highly qualified experts for the tourism sector, the Azerbaijan Tourism Institute was established with the decision 13th of February 2006. Every year, more than 200 students are graduating from Azerbaijan Tourism Institute. In addition to the Institute, there is also Mingachevir Tourism College and Baku Tourism Vocational School. In addition, the Ministry of Culture and Tourism and the Azerbaijan Tourism Association organize periodic training courses for those working in the tourism sector. 82.6% of the students agreed in the idea that they need qualified labor force for the development of rural tourism which gives tourism education in Azerbaijan ($\bar{x}$=4.13).

Rural tourism activities are an important opportunity for female labor force. The widespread nature of home production and handicraft production in rural tourism creates income opportunities for women [10]. More than half of the students (%56.6) agreed in this idea ($\bar{x}$=3.41). While 24.5% were undecided.

64.3% of the students did not agree to the idea that the work of the Ministry of Tourism was sufficient to contribute to the development of rural tourism and to contribute to the country's economy ($\bar{x}$=2.35), and they did not take part in the idea that rural tourism would not develop with the operation of a single institution ($\bar{x}$=3.27). In addition to single state institutions, private airlines, special education institutions related to rural tourism etc. can be used for the development of rural tourism and contribution to the national economy, the students think that these idea would contribute in the private sector.

60.6% of the students did not agree with the idea that there is cooperation and necessary communication between the basic institutions of the region in terms of development of rural tourism ($\bar{x}$=2.47). This high rate is a reflection of not having the necessary cooperation and communication between the organizations and units related to rural tourism in Azerbaijan.

Tourism agencies have an important place in the development of tourism. Tourism agencies often send tourists abroad, but they are weak in attracting foreign tourists to the country. While sending tourists abroad is important, the development of domestic tourism is a should also be prioritized. The students were aware of this situation and showed that there was a sufficient number of specialized travel agencies dealing with the types of rural tourism ($\bar{x}$=2.14).

One of the important factors of tourism is advertising and promotion. Advertising is an important factor affecting the country's demand in the national and international tourism market. Countries that have a say in international tourism invest heavily in advertising and promotional activities in order to preserve their image. The Ministry of Tourism participates in more than twenty international tourism fairs in the world's leading countries each year with fifty pieces of visual and printed media products produced in nine languages, each of which is about the richness of the country's tourism potential in order to promote the historical, touristic and cultural values of Azerbaijan and to increase its market share [14]. Nevertheless, the students showed low participation in the expression “the introduction of the natural and cultural wealth of Azerbaijan is sufficient” ($\bar{x}$=2.80). This shows that the studies carried out in Turkey or abroad have not been perceived as sufficient and are still insufficient. These activities may indeed be inadequate, or the relevant units may not be able to tell the public what they are doing.

Rural tourism development infrastructure is very important. For this purpose, the state should establish appropriate communication (Internet, telephone infrastructure), accommodation, transportation (land, air and railway transportation facilities), regional transport, urban-rural communication connections and other infrastructures necessary for the development of rural areas. 68.8% of the students did not agree with the idea that there are no significant infrastructure problems in the rural tourism of Azerbaijan ($\bar{x}$=2.31). They think that there are infrastructure problems related to rural tourism in Azerbaijan and the related institutions should take concrete steps.

In order to improve rural tourism and to achieve good results in this direction, it is necessary to raise the awareness of the rural population of the country. In developed countries, regular training are frequently given. In Azerbaijan, steps have been taken in this regard. With the support of the Youth Foundation, the project "Promoting rural tourism among young families" was initiated. The aim of the project is to organize conferences and seminars in the regions of Azerbaijan which have the potential for rural tourism and to raise awareness of local people [8]. Nevertheless, 63% of respondents have not agreed to the idea that the Azerbaijani people were conscious of rural tourism ($\overline{x}$=2.38). This finding can be interpreted as the promotion of rural tourism in Azerbaijan is not sufficient and a large part of the population is ignorant about it. In this respect, relevant organizations should make advertising campaigns and public awareness in this direction.

The opinion of the students of the Department of Agricultural Economics about the impact of rural tourism on the environment and cultural structure.

The idea that rural tourism is not developed enough in Azerbaijan and the lack of investments in this field may have a negative impact on the cultural structure of rural tourism. As a result of the friendship between the tourists visiting rural areas and the local people, there are changes in the education, tradition and culinary culture of the local people. These changes can be positive if they are slow and manipulative, but can lead to cultural degeneration if they are fast and unstructured. However, cultural tourism structures that are present in the areas where tourism will be made are being protected and restored by the tourism sector, thru these, the forgotten customs and traditions can be revived. [15]. Despite all the positive aspects, 71.3% of the students exhibited a more negative attitude and believed that rural tourism could change the cultural structure of the local population negatively. This high participation can be an indication that students cannot fully understand the dynamics of the society and cannot fully establish rural tourism in their minds. Otherwise, it is expected that a conscious local people will not lose their social values with provided education; and strong private sector and government support ($\overline{x}$=3.78). In connection with this statement, students were worried that environmental problems would increase in rural areas and half of the students (50.8%) agreed in the statement that unplanned and unorganized rural activities would cause environmental problems ($\overline{x}$=3.31). While a quarter of the respondents (25.8%) have stayed undecided regarding this idea.

CONCLUSIONS

This research was carried out in order to examine the awareness levels of the students studying in the Department of agricultural economics of Azerbaijan State University. The effects of the students' gender, place of residence, school level, and parents profession on rural tourism awareness levels were examined. Participation rates were measured in terms of determining their level of awareness and perceptions on rural tourism. There were significant differences between students' gender, place of residence, and professional status of their parents based on their views on rural tourism. However, no statistically significant difference was found between the age, monthly total household income and class variables according to the level of rural tourism awareness that the students' possessed. In the last part of the study, which evaluation of students' perceptions and awareness about rural tourism were examined, the following important results are found.

The students showed high participation in the idea that Azerbaijan has rich rural tourism potential. Given the geographical location and climate conditions of Azerbaijan, this high turnout is expected. But they have come to the conclusion that this rich potential has inadequate promotion process. In recent years, Ministry of tourism has carried out numerous studies on promoting these awareness. The fact that students are unaware of this, may be such studies have been carried out in recent

years and courses related on rural tourism are not given. Students agree that one of the necessary conditions that needs development on rural tourism are infrastructural problems and necessary investments should be made by the government to eliminate them. However, they believe that financing opportunities in this area are not enough and limited. They emphasize that the work of the Ministry of tourism alone will not be sufficient in order for rural tourism to grow and contribute to the economy of the country, and that the people and all sector of the community should be united regarding this issue. Moreover, they also think that the development of rural tourism and the inadequacy of promotion are related to the inadequate number of travel agencies which operates in related areas and working inefficiently with the desired activity (advertising, promotion, awareness, etc.). in long run, it is believed that this type of tourism can have negative effects on the cultural changes and environmental problems in the lands where rural tourism activities take place.

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TAX EVASION FROM LEGALITY TO OFFENCE

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Abstract

Tax evasion is the most widespread national and international economic crime and occurs by avoiding, in bad faith, the payment of taxes or by changing the information to be reported to the authorities, all of these with the purpose of diminishing the revenues and profits or of artificially increasing the expenses. By tax evasion, the natural or legal person has a direct intention to commit the offence, because he/she plans it and pursues to obtain a profit from this activity. The fight against tax fraud is becoming a priority in Romania, because tax evasion has an impact on the public services, it fraudulently appropriates public funds and delays the economic growth. This paper tries to indicate the causes of this type of offence, and also methods, statistics and prevention measures.

Key words**:** *tax evasion, offence, fight against, public funds*

INTRODUCTION

The idea of tax fraud or tax evasion has been a constant concern of the specialists as regards the diminishing of this phenomenon, by successively amending the laws and by developing an investigation methodology in order to promptly react to discover, investigate and fight against the phenomenon. The economic and financial crime is an ongoing phenomenon, continuously evolving, because the offenders discover sophisticated methods to use in order to avoid the law and to cover their criminal tracks, giving a legal appearance to their businesses and acquiring illegal financial resources. The most important law on the prevention and fight against tax evasion is Law 241/2005, as amended and supplemented, with the addition of the Fiscal Code, the Fiscal Procedure Code, and the Customs Code, with the related implementing acts.

Tax evasion is based on several factors: faulty laws, lack of clarity in levying taxes and duties by the financial authorities, taxpayers' behavior and corruption of public servants [3, 4].

As regards the law, tax evasion has two meanings, a strict meaning and a wide meaning [11].

„*Lato sensu*, tax evasion represents the avoidance by taxpayers of paying taxes or tax liabilities to the general government balance, including the payment of customs duties;

Stricto sensu, tax evasion represents the avoidance by taxpayers of paying taxes or tax liabilities to the general government balance, excluding the payment of customs duties"[4];

Some experts differentiate between two categories of tax evasion, according to its features:

-Legal (licit) evasion;

-Illegal (illicit) evasion.

Others do not agree with the name „legal evasion", suggesting that it should be named „tax optimization", because they do not consider that suspicion of evasion exists, because these facilities are allowed by the law and are not made in bad faith; they are rather an avoidance of paying the general tax liabilities. This type may be associated with the creative accounting the procedures of which it uses and which are based on the accounting regulations, but uses the faults of accounting standards and the mechanisms that are made available to the specialists in order to change the information they present in the financial statements [9].

The illegal tax evasion is more widely spread than the licit evasion, some estimate that it exceeds with 15% the GDP of the country.

As regards the territory, some may classify tax evasion as follows:

-National tax evasion;

-International tax evasion.

In turn, this type of offenders may be classified in several typologies or categories. Some use complex financial methods, while others act primitively or in a rudimentary manner.

Specific for tax optimization is that the natural or legal person does not hide the source or the tax liability, but, in compliance with the law, he/she/it manages to avoid the payment of some taxes, contributions or duties or to diminish these liabilities for the state or local budget.

There are multiple causes that promote **the licit or legal tax evasion**, and here are some:

-Granting of tax expenditure such as total or partial exemption from payment, tax mitigation, deductions (for example, social security charges - 5% of the total salary costs are nontaxable; food expenses, expenses related to the use of company houses, contributions to the private pension funds in amount of 400 EUR/employee/year incurred by the employer, voluntary sickness insurance premiums in amount of 400 EUR/employee/year incurred by the employer; 50% as deductible expenses for the personal use of the company car; delegation allowance)

-Salary tax exemptions for the IT field;

-Exemptions for the employees in the construction field (precautionary labor contribution (Romanian: CAM), deductions for social security contributions (Romanian: CAS), exemptions from tax on salary, exemptions from the payment of the contributions to the health insurance (Romanian: CASS)

-Granting of some temporary exemptions, in case of newly established companies;

-Growth which is economically unjustified by unregulated general costs incurred by the companies;

-Taxation of higher than the average wage incomes as they were average wage incomes for the benefit of those with higher than average wage incomes, through non-payment of taxes resulting from this difference;

-Accelerated depreciation leads to a higher depreciation than the one resulted from the wear and tear allowances on fixed assets, by diminishing the corporate tax;

-The possibility to change some employees in self employed by the conclusion of consulting agreements or service agreements, by diminishing the costs incurred by the employer for the labor contract;

-Removal from the scope of taxation of incomes resulted from bank deposits and of investments in state bonds;

-Exemption from the payment of import and export duties for some categories of goods and services;

The illicit tax evasion is detailed in art. 3-9 of Law no. 241/2005.

The offenses involving concrete methods of avoiding the payment of tax liabilities are provided in art. 9. and the related crimes of attempted tax avoidance and fraud related to the failure of taxpayers to pay their tax duties correctly are provided in art. 3-8 [13].

,,-Art. 3. The taxpayer, with intent or willful misconduct, fails to restore the damaged accounting records within the period specified in the audit reports;

-Art. 4. The unjustified refusal of a person to present the legal documents and the business assets to the competent authorities in order to prevent the financial, fiscal or customs controls, within 15 days at the most from the letter of notification;

-Art. 5. Preventing, in any way, the competent authorities from entering, by observing the law, the premises, locations or lands, for the purpose of carrying out financial, tax or customs audits;

-Art. 7(1). Withdrawal of some rights - Holding or putting into circulation, without right, of stamps, bands or standardized forms used in the fiscal field under a special procedure;

-Art. 7(2). Withdrawal of some rights - Printing, using, holding or putting into

circulation, knowingly, of counterfeit stamps, bands or standardized forms used in the fiscal field under a special procedure;
-Art. 8(1). Withdrawal of some rights - Calculation, in bad faith, by the taxpayer, of taxes, duties or contributions, resulting in obtaining, without right, of amounts of money as reimbursements or returns from the general government balance or compensations due to the general government balance.
-Art. 8(2). Withdrawal of some rights - Collusion in order to commit the act stipulated in paragraph (1);
-Art. 8(3). The attempt to commit the acts provided for in paragraphs (1) and (2);
-Art. 9(1).
a) Concealment of taxable or dutiable asset or source;
b) Failure, in whole or in part, to record in the accounting or other legal documents, the business transactions performed or the revenues obtained;
c) Recording, in accounting or other legal documents, of expenses that are not based on real transactions or recording of other fictitious transactions;
d) Alteration, destruction or concealment of accounting documents, of memory banks from the fiscal electronic cash registers or of other data storage means;
e) Keeping of double accounting records, using documents or other data storage means;
f) Avoidance of financial, tax or customs audits by the failure to declare, the fictitious or inaccurate declaration of the main or secondary offices of the audited persons;
g) Substitution, degradation or transfer by the debtor or by third parties of the assets seized according to the provisions of the Fiscal Procedure Code and of the Criminal Procedure Code.
(2) If the acts provided for in paragraph (1) caused a prejudice of more than EUR 100,000, in the national currency equivalent, the minimum and maximum limit of the penalty provided by the law shall be increased with 5 years.
(3) If the acts provided for in paragraph (1) caused a prejudice of more than EUR 500,000, in the national currency equivalent, the minimum and maximum limit of the penalty provided by the law shall be increased with 7 years [7] [5].
The control activity within the companies could play an important part by identifying in due time the problems they are facing and by offering the decision maker operative and relevant information regarding the main issues of the company or of the managed assets [8].

MATERIALS AND METHODS

This paper is based on the analysis of the statistical data from the National Statistics Institute and the Ministry of Justice and the investigations made during the period 2013-2018. The results are also based on the analysis of the activity of the Prosecutor's Office attached to the Bucharest Court of First Instance in 2017, as regards the economic and financial offences.
The analyzed indicators are the following:
- **At the level of the courts of law**, as regards the money laundering offences, a total of 903 case files have been registered, with 419 case files being disposed of, and, as regards the tax evasion offences, in the same period, a total of 23,363 case files have been registered, with 13,574 case files being disposed of.
- **At the level of the Prosecutor's Office attached to the Bucharest Court of First Instance, in 2017,** for tax evasion offences, 20 indictments have been drafted, compared to 31 indictments in 2016, 60 defendants being indicted, compared to 51 in 2016; as regards the money laundering offences, 9 indictments have been drafted, with 33 defendants being indicted, compared to 6 indictments in 2016, with 23 defendants being indicted.

RESULTS AND DISCUSSIONS

An economic entity trying to avoid the payment of tax liabilities has several options to reach this goal:
In case of **corporate tax**, the tax evasion methods are the following:
- Expenses that are not based on supporting documents;

- Expenses that exceed the limit approved by the law;
- Deductions of personal expenses of the administrators;
- Failure to register the revenues obtained;
- Register of lower delivery prices;
- Failure to calculate the taxes due by the nonprofit organizations related to the revenues obtained from business activities;
- Failure to register in the accounting books the differences identified by the control authorities;
- The transfer of taxable revenues to newly created companies within the same group, that are within the exemption period.

As regards the **value-added tax (VAT)**, the following methods may be used:
- Failure to register as payer when exceeding the limit;
- Repeated calculation errors;
- Unjustified reimbursement;
- Declaring of some imports as temporary;
- Delay of issuing the fiscal invoice;
- Incomplete records in the purchase register;
- Economic entities issue invoices without VAT registering and payment;
- Fictitious deeds of donation from the external partners in order to avoid VAT payment related to imports;
- Failure to declare in returns the VAT related to customs clearance;
- VAT deduction in connection with the liabilities that are exempted from the right to deduct;
- Deduction based on illegal documents or without documents.

As regards the **payroll tax**, the most frequent methods related to fraud are the following:
- Non-taxation of paid earnings from work;
- Failure to register and pay the payable taxes on wages;
- Failure to register the payment liabilities;
- Fictitious expenses for the wages of some persons;
- Creating facilities for employees in view of paying lower taxes to the state budget;
- Failure to observe the laws on tax base.

In case of **excise duties**, the tax evasion methods are the following:
- Failure to include the taxable amounts in the tax base;
- Undervaluing the imported goods in customs with double documents;
- Failure to calculate the excise duties according to the alcohol content;
- Failure to include the excise duties in the sales prices;
- Failure to register in the accounting books the payment liabilities regarding the excise taxes;
- Changing the name of the products for which excise duties are to be paid in products with lower contribution, in order to avoid the payment of excise duties [1].

In case of other taxes, contributions and duties due to the state or local budgets, the following tax evasion methods have to be taken into account:
- Buildings are registered in the accounts with values that are lower than the market value;
- Failure to declare to the fiscal authorities the buildings, motor vehicles and lands belonging to the economic entities;
- Failure to declare the income earned by natural persons from various activities;
- Failure to withhold the dividend tax;
- Failure to appear in front of the fiscal authority or the alteration of the information supplied by the cash registers of the self-employed persons, regarding taxi services;

The economic entities exploit the lack of training of the control personnel and the regulatory gaps in the fiscal laws, applying new evasion methods impacting the public funds and generating huge damages.

Among these methods, some may mention the following: simulation of exports, transfer, on paper, of the operations through several companies, and bank transfers that simulate fictitious liabilities between partners. The stake of such fictitious circuits could be the diminishing of the corporate tax, the unlawful deduction of VAT, the avoidance of excise duty payment, thus providing for a perfect money-laundering environment [2].

Here we may specify the following crime schemes:

(i)Dummy companies that do not operate at the declared registered office, have partners or

administrators which cannot be contacted and do not submit the financial statements to the fiscal authority.

The dummy companies are used by the beneficiary in order to avoid the payment of taxes to the state budged, but with an appearance of legality.

(ii)**Carousel fraud** uses two methods:

- The first method, by which an economic entity from the country of origin issues an invoice, VAT excluded, being an intra-Community supply, and the entity from the country of destination applies the reverse charge. The entity from the country of destination issues an invoice to a direct beneficiary or through other dummy companies, without declaring the VAT that subsequently disappears, and the final beneficiary has the right of VAT deduction.
- The second method is a fictitious invoice to a presumptive intra-Community partner (VAT excluded), and this operation is followed by the sale of goods on the internal market, without issuing accounting documents or this scheme may be continued with the sale by the external partner to the Romanian beneficiary, through an intra-Community delivery with no VAT. In this case, the goods may be physically moved from the supplier to the beneficiary, without leaving the country, but, on paper, the intra-Community partner is included.

(ii)**Offshore companies** are companies that are registered in countries or territories where the taxation is lower or zero.

An offshore company is used by the economic entity for fictitious intra-Community deliveries, liquidation of stocks with no accounting documents in order to obtain the deductible VAT and laundering of money resulted from tax evasion in Romania.

(iv)**Contraband with excise goods** is made by illegally bringing the products and their storage in a place that is not an authorized fiscal warehouse, with the purpose of their illicit sale [6].

State and reports regarding tax evasion

(a)Statistical data from the Ministry of Justice - State of cases and convicted persons, 2013-2018

According to the state of cases involving economic offences prepared by the Ministry of Justice, some may see a higher number of case files involving tax evasion offences, of 23,363 cases compared to 903 cases involving money laundering offences, indicating a higher vulnerability as regards tax evasion. Another issue that some may observe is the lack of mitigating these offences, according to the approximate similarity between the initial fund of cases and the number of received cases. As regards the money laundering offences, the initial fund was of 424 case files, and 479 received cases, and as regards the tax evasion offences, the initial fund was of 9,763 case files, and 13,580 received case files. These statistical data highlight the large number of offences registered each year and the lack of control performed by the control authorities.

An important issue is the files left unanswered, due to the shortage of judges in relation to the large number of registered files

Table 1. State of cases and convicted persons, 2013-2018

State of cases and convicted persons *-01.01.2013-31.12.2018								
Object causes	The competent court	Stock initially- no. causes	No. of incoming causes	Total causes	No. of solved causes	Stock causes at the end of the period	Number of convicted persons in mainstream cases	
							Total, out of which:	Minors
Tax evasion offenses								
Money laundering offenses Law656/ 2000	Court	0	0	0	0	0	0	0
	Law Court	266	235	501	194	307	211	0
	Court of Appeal	158	244	402	225	177	28	0
Tax evasion offenses (Law87/1994, Law241/ 2005	Court	2121	1998	4119	2506	1613	845	2
	Law Court	5439	5784	11223	5328	5895	3576	5
	Court of Appeal	2203	5798	8021	5740	2261	16	0
*in mainstream cases								

Source: [10]

(b) Situation of the activity of the Prosecutor's Office at the Bucharest Court in 2017, regarding economic-financial crimes**.**

In 2017, the Prosecutors of the Prosecutor's Office attached to the Bucharest Tribunal focused mainly on the recovery of the damages found out of offenses of tax evasion and money laundering.

The damages identified with the help of the anti-fraud inspectors in the cases investigated in 2017 amounted Lei 264,814,459 (EUR 57,946,271, respectively).

In 2017, the Prosecutor's Office attached to the Bucharest Court of First Instance has prepared 20 indictments in cases regarding **tax evasion offences**, compared to 31 indictments in 2016, 60 defendants being indicted, compared to 51 defendants in 2016.

In 2017, the Prosecutor's Office attached to the Bucharest Court of First Instance has concluded 10 plea agreements with 10 defendants, in cases involving **tax evasion offences.**

In 2016, there were no plea agreements in cases involving **tax evasion.**

As regards the **money laundering offence**, 9 indictments have been prepared, 33 defendants being indicted, compared to 6 indictments in 2016, and 23 indicted defendants.

In 2017, the Prosecutor's Office attached to the Bucharest Court of First Instance has concluded 3 plea agreements with 3 defendants, in cases involving **money laundering offences.** In 2016, there were no plea agreements in cases involving money laundering.

The damages acknowledged in the indictments and plea agreements as being caused by committing the **tax evasion offences** were of Lei 38.8 million (EUR 8.6 million), compared to Lei 35.7 million in 2016 (EUR 7.9 million).

The value of the damages caused by committing **tax evasion offences** and paid in 2017 to the state budget, by virtue of Art. 10 of Law no. 241/2005, amounted Lei 23.6 million (EUR 5.2 million).

The total value of the amounts representing the physical object of the **money laundering offences**, indicated in the indictments was of Lei 71.5 millions (EUR 15,881,643 respectively), compared to 2016, when the total value of the „laundered" amounts was of Lei 56.8 million (EUR 12.6 million).

The value of the precautionary measures indicated in the indictments and effectively implemented amounted Lei 34.2 million (EUR 7.6 million), compared to Lei 15.6 million in 2016 (EUR 3.4 million). In 2017, **the activity of investigating economic and financial offences** was affected by a series of deficiencies with negative impact on the efficiency of investigation and disposal of cases involving tax evasion and money laundering offences.

In 2017, 1,084 cases, for which more than 3 years elapsed from the day of their notification, have been disposed of (for 687 cases, more than 5 years elapsed from the day of their notification). As regards the cases registered in our prosecutor's office, which are older than 5 years (227 case files) and are not disposed of, their high number is also determined by the change of jurisdiction for the courts of law (implemented by Law 202/2010 on some measures taken in order to accelerate the trial disposition). **The change of jurisdiction of the prosecutor's offices attached to the courts of law resulted in an increase of the number of cases involving tax evasion offences investigated by this public prosecutor's office.**

According to art. XIII item 3 of the above mentioned law, **tax evasion offences** provided for in art. 9 of Law no. 241/2005 for the prevention and fight against tax evasion, as subsequently amended, are under the jurisdiction of the courts of first instance. Thus, in 2011, a number of 4026 cases were registered with the Prosecutor's Office attached to the Bucharest Court of First Instance and allocated to the prosecutors of the prosecution oversight division. During the period 2012-2017, the local prosecutor's offices (notified in 2010 or previously), as well as other structures of the Public Prosecution Service have declined their jurisdiction in favor of the Prosecutor's Office attached to the Bucharest Court of First

Instance regarding a significant number of case files (hundreds) involving offences provided for in art. 9 of Law no. 241/2005 [12].

CONCLUSIONS

The mechanism of tax evasion does not operate within the developed societies. Each time a society creates a coherent system of tax collection, inevitably, methods to avoid their payment also emerge. The laws of the European member states and of Romania are similar, the difference occurs in the application of legal provisions, the organization and functioning of the state tax system, the judicial decisions taken in the cases of tax evasion and, last but not least, the consolidation of the trust relation between the tax authorities and taxpayers. The tax evasion offence is committed by submitting incorrect or incomplete information to the tax or customs authorities, by hiding tax information by failing to declare the income, by using fiscal signs and symbols with no right, by reducing the taxable base for its own benefit or for the benefit of other person, all these acts being committed with intent.

We suggest that, in the near future, the following implementing measures to be taken:

• Providing for the equality of taxpayers as regards the taxes, as main principle of the fight against tax evasion;
• Increasing the control efficiency;
• A better acceptance, by the taxpayer, of inspections: a coherent, correlated, efficient control, with a minimum impact on the taxpayer's activity;
• Continuous improvement of the fiscal indiscipline prevention activities;
• Highlighting the preventive and educative role of control;
• Transparency in the institutions authorized to implement laws and to perform controls of the taxpayers;
• Increasing the professionalism and integrity of the employees of the control authorities;
• Lower taxation, but used more efficiently;
• Providing assistance and guidance to taxpayers which are more specialized and adapted to their needs;
• Software, information about the laws and of public utility - all provided free of cost;
• Providing for the refunding, within the legal period, of the amounts due to the taxpayers, for them to be able to finance their activity;
• Providing for an environment in which, in relation with the tax authorities, and also with the competitors, the provisions of the Fiscal Code and of the Fiscal Procedure Code are observed;
• Fight against corruption among its own employees;
• Providing for a polite and amiable behavior of the public servants in relation with the taxpayers.

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STATE AND DEVELOPMENT OF AGRICULTURAL MODELS IN BULGARIA

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Abstract

Bulgaria is known with deep agricultural traditions. The importance of understanding the model of agricultural farms in the country is of a great importance for sustainable sector. The existing models are characterized with a great variety by all indicators connected with organizational forms, management, productive structures, utilized land, access to funds, environmental orientations etc. The reviewed models are based on external and internal functional environment. The main aim of the study is to reveal the changes in agriculture models of farming in Bulgaria. The set up tasks are: 1) literature review of the main agricultural models. In this part are summarized agricultural models with their characteristics; 2) evidence of Bulgaria of existence of main agricultural models and their role for the sector; 3) analysis of statistical data of distribution of different agricultural models; 4) main findings and conclusions.

Key words: *agriculture models, farms, structures, management*

INTRODUCTION

The agricultural holdings in the country are characterized by a great diversity in terms of organizational forms, management and structure of production. The state of production structures in agriculture determines the possibilities for effective development of the sector and the conditions for the implementation of the policy measures.

Agricultural researches show a strong connection between changes in industry and improved infrastructure, which leads to increased efficiency of farms and hence better access to raw materials, the possibility of selling products, etc.

Farm models can be conventionally summarized and divided into two large groups that have a different model of functioning, management, and development. Agricultural sector traditionally is dominated by small farms, where management decisions are combined with the aims of household and farm development. The development of these farms largely dependent on the owner's personal qualities, abilities, knowledge and skills [20] [30].

Model of large agricultural holdings

The main features of large farms are the number of objectives that must be in conformity with the capabilities of the business structure as well as focus mainly on profitable activities [19]. The decision-maker is the owner or hired manager, and his motivation depends on the person's professional qualities. The main criteria for choosing specialization is maximizing profits, maximizing resource using, investing in the best possible combination with long-term goals [17].

The literature review shows that the large farms also come under the name "agribusiness structure," meaning "large, technologically complex companies" [19] with a market-oriented production mainly from grain crops. Examples of existing of such a structure are found in countries with good conditions for agricultural activities and a liberalized policy such as Brazil and Argentina. The model of functioning of this type of farming is known as the Northern Model of Agriculture and is presented in Figure 1.

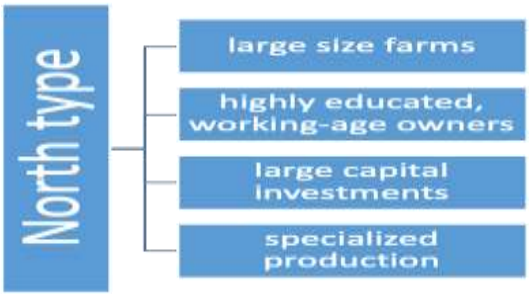

Fig. 1. North type of agriculture
Source: own adaptation.

Model of functioning of a small farm

Since 1970, there have been authors who have tried to find out the reasons for the emergence and existence of small farms, and they conclude that they must first understand the reasons for their existence and development and, through proper policies, which can lead to restructuring the agrarian sector [9]. All this determines the existence of different models of agriculture. In Bulgaria, the reasons for the existence of farms classified as small are complex. It is very difficult to separate the influence of all the factors that affect this type of farms. According to the literature, often aggregated factors are divided into the following groups: macroeconomic factors; demographic factors; agricultural policy; market-related factors, etc. [7]. Small farms are also known in the literature as the southern type of farming, which are characterized by a low level of mechanization, cheap labor and expensive land. The model is presented in Figure 2.

Fig. 2. South type of agriculture
Source: own adaptation.

Models of agricultural holdings according to level of sales, distribution of the outcomes (subsistence, semi-subsistence and stock agricultural holdings)

Specific model can be proposed by the level of sales. The agricultural holdings can be compared according to the volume of sales made. The division is in monetary terms and is classified as a percentage of sold production. As a weakness, it can be noted that the current dynamics in terms of prices of demanded and supplied agricultural commodities in different markets can materially distort the real state of the surveyed farm. In a time, perspective, knowing the specifics of agriculture and its influence from climatic factors, the same farm with the same specialization and productivity [13] can realize a drastically different volume, quality and price production, respectively, to be included in a different group [11]. These factors of different outcome because of the size of the farm are observed mainly of livestock breading [12] [22].

Over the years, many authors [7] [8] [16] [19] also use divisions of farms according to their degree of stock for sale. Under this statement, farms are divided into natural, semi-subsistent and subsistent farms. The subsistent farming model has been studied by a number of authors and in the field of the economy, often referred to as "agriculture in which plant production, livestock farming and other activities are mainly carried out for by the household consumption characterized by low productivity, risk and insecurity" [31].

Semi-subsistent farm as a terminology in the literature is often described as semi-stock farm and is well known structure in CEE. [14] [17].

From an economic point of view, the creation of semi-subsistence farms is mainly due to the lower income per person in rural areas compared to urban ones. Also, higher unemployment in the villages forces households to focus on agricultural activity. The slower development of rural markets is the reason for the slower commercialization of farms [14] [27].

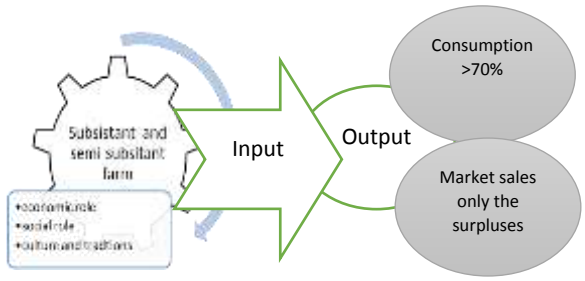

Fig.3. Model of subsistent and semi-subsistent farms
Source: own findings.

From Scheme 1 it can be concluded that natural and semi-subsistence farms are users of inputs, but they only participate in the production market in the presence of surplus after satisfying the household. Researchers working in the field of small farms burden the farm sales via barter, thus households receive a variety of products that they would not buy under market conditions due to lack of monetary income [18].

Agricultural model by legal status

Agricultural holdings can be distributed by legal status and form models. They are formed on the basis of public needs for different agricultural products influenced by the natural, economic, technological and other conditions of a particular region or farm [16].

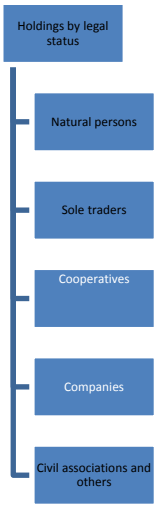

Fig. 4. Agricultural model by legal status
Source: own adaptation.

The level of differentiation of the organizational form is described as the interaction between the owner of the organizational form and the resources in a private and collective economy. Production structures in agriculture, according to their status, are divided into: agricultural holdings of individuals; sole traders and cooperatives. Cooperatives are emerging alongside the intensive development of commodity-money relations as early as the era of initial capital accumulation. They are characterized by the following statements:

-the cooperative is a voluntary form of human associations;

-type of organizational form of public production;

-a business organization.

Typical for Bulgaria is part of the land to be organized in a cooperative. In this way, small landowners can benefit from better input prices for inputs such as preparations, seeds and fertilizers. Also farmers can have access to mechanized services at every stage of the activity. Last but not least, the cooperative also provides employment to a part of the landowner members.

Model of family agricultural holding

Models of family agricultural holdings are a useful tool for exploring how household-specific transaction costs are formed, as well study the impact of foreign policy and market changes in rural areas [29]. Models of family agricultural holdings reveal the relationship between household and farm, focusing on their consumer and productive activity.

The family agricultural holding is considered as the primary and primary form of organization in agriculture. According to some authors [3], the risk arising from the production and realization of the production is taken over entirely by the farm owner and his family. Other authors [25] define the family farm as a specific organizational form that brings family, household and enterprise into one community.

According to Chayanov [6], the purpose of the family farm is to provide the means for family existence in the fullest use of the factors of production and labor. The main approaches to studying family farms are organizational, managerial and social [8]. According to the first, the family farm is a production unit in which the family is the main source of labor on the holding. The

management approach considers the farm as an individual economic unit, and the social as a working couple and their children living together in one household.

Models of agricultural holdings according to the amount of input labor and the income earned from agricultural activities

Models of agricultural holdings with part-time employment and hired labor are subject of research by a number of authors from the 1960s up to now. [4] [10] [23] [26]. According to some of the listed authors, farms are divided by income as follows: below 30% - a complementary source of income; 30-50% partial supplementary source of income; over 50% of basic income. The holdings, according to the criteria, can be combined in terms of employment. According to the employment, farms are divided into farms that provide full time employment and those that provide part-time employment. It explains the existence of small farms with part-time employment in the agrarian sector, as the ability of the household to optimally combine the free time of the members of the household with supplementary income [28].

Diversified model

This model adopts production principles based on "nature's work" as ecosystem services without prohibiting the use of synthetic or biological raw materials [21]. As with other farming systems, farmers in the diversified model apply adaptive management to reduce uncertainty. The model involves creating new organizational forms that interact with each other through knowledge sharing to reduce the risk of agrarian activities. Managements of these farms have developed good practices for different types of activities.

The main characteristics that distinguish this model from the rest are:

(a) nature is seen as a major factor in the production and living space of people;

b) introducing new social forms aimed at restructuring production in order to increase productivity.

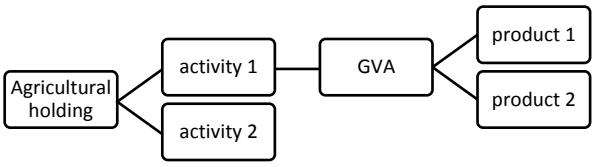

Fig. 5. Diversified model of agriculture
Source: own adaptation.

Model of organic farming

The integrated assessment of agricultural and environmental policies requires different levels of analysis and includes scientific method used in different disciplines [1] [2] [15]. Therefore, bio-economic models of agricultural holdings for integrated assessment, should meet a number of important requirements. In existing models, the farm is a key element [24]. The organic farming model is directed to combining best environmental practices, maintaining a high level of biodiversity. The organic farming model is a comprehensive production management system that promotes and strengthens agro-ecosystem sustainability, including biodiversity, biological cycles and soil biological activity.

According to some authors [5] the organic farming model explores an agricultural management and food production system that combines best environmental practices, maintains a high level of biodiversity, preserves natural resources, applies high standards of welfare to animals and production methods to the preferences of some consumers towards products made using natural substances and processes.

MATERIALS AND METHODS

The main aim of the study is to reveal the changes in agriculture models of farming in Bulgaria.

In the first part is made a literature review of the main agricultural models. In this part are summarized agricultural models with their characteristics. On a theoretical level by system approach is made summarization of the literature findings and adjustments of the

model. Some of the models are presented in figures.

In the second part is shown an evidence of existence of main agricultural models and their role for the sector. In this part according to statistical data and own calculations Bulgarian's farms are classified to specific models and is made an analysis. In the last part of the publication are made some conclusions for the state and development of different type of farm models in Bulgaria.

The results are part of scientific project DN 15/8 Sustainable multifunctional rural areas: Reconsidering agricultural models and systems with increased demands and limited resources funded by the Bulgarian research fund.

RESULTS AND DISCUSSIONS

Agrarian activities are traditional for Bulgaria. The growth rate of the output of the agricultural sector is 5% for the survey period and entrepreneurial income for the same period – by 2%. The data are presented in Table 1.

Table 1. Main economic indicators for the Agriculture sector, 2010-2016, million BGN

	2010	2013	2016
Output form Agriculture sector	7,474.8	8,593.3	7,830
Gross value added at basic prices	2,651.3	3,313.8	3,475
Intermediate consumption	48,253.5	5,279.5	4,356
Entrepreneurial income	2,241.3	3,058.8	2,285

Source: MAFF, Agrostatistics Department, DG ARP, FSS.

The main indicators for the development of the agrarian sector, presented in Table 2, indicate that the number of farms is decreasing, but the arable land is increasing. In addition, the output of the agricultural activities has increased by 54% and the labor input is decreasing. According to this information, it can be argued that in Bulgaria the role of large farm as well as the productivity of one farm is strengthened.

Table 2. General indicators of the agrarian sector in Bulgaria

General indicators	2010/2016
Agricultural holdings (number)	-46%
Agricultural holdings and units providing common land for grazing animals* (number)	-46%
Utilized Agricultural Area of the agricultural holdings (ha)	5%
Total Utilized Agricultural Area (common land incl.)* (ha)	0%
Total standard output of agricultural holdings (thousand euros)**	54%
Livestock units	-7%
Labour input - AWU	-38%

Source: MAFF, Agrostatistics Department, DG ARP, FSS.

In terms of the economic size of the agricultural holdings in Bulgaria, according to the information presented in Table 3, it is observed that the number of small farms are decreasing, the most significant is decrease in the group up to 2,000 Euros, which is nearly 60% reduction.

Table 3. Economic size of the holdings, 2010-2016

Limits in EUR	2010	2013	2016	% 2010/ 2016
	370, 222	254,142	201,014	-46%
< 2 000	255,105	140,228	104,898	-59%
>= 2 000 < 4 000	59,473	51,384	34,956	-41%
>= 4 000 < 8 000	26,286	27,547	22,955	-13%
>= 8 000 < 15 000	12,509	13,849	13,746	10%
>= 15 000 < 25 000	6,043	7,056	8,248	36%
>= 25 000 < 50 000	4,733	6,020	6,675	41%
>= 50 000 < 100 000	2,535	3,229	3,967	56%
>= 100 000 < 250 000	1,908	2,383	2,676	40%
>= 250 000	1,630	2,446	2,893	77%

Source: MAFF, Agrostatistics Department, DG ARP, FSS.

There is also a tendency to increase the number if the large farms by over 40% in the

all groups, and in the largest group the increase reaches 77%.

According to the development of agricultural models depending on the purpose of the production, over the past 20 years the tendency is in increasing the share of the production which is for sale. The data is presented in Figure 6.

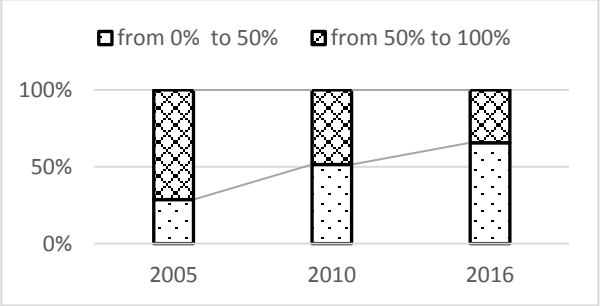

Fig. 6. Distribution of Bulgarian farms according to the % of sale and own consumption.
Source: MAFF, Agrostatistics Department, DG ARP, FSS.

Bulgarian agriculture is restructuring and this reflects on the legal status of the units. During the last 16 years is observed decreasing trend of farms registered as a natural person (-50%) and solo traders (-11%) and cooperatives (-18%). The highest increment is observed in the category of companies, where the increase is with 74%. The data shows that the companies are very rapidly developing and the model of big farms is dominant. The data is shown in table 4.

Table 4. Holdings by legal status

	2010	**2013**	**2016**
Natural persons	350,041	237.317	175,209
Sole traders	2,134	1,871	1,892
Co-operatives	941	811	767
Companies	3,639	4,323	6,322
Civil associations and others	319	272	258

Source: MAFF, Agrostatistics Department, DG ARP, FSS.

In Table 5 is presented the dynamic of the distribution of persons by type of labour. From the information can be concluded that the family labour is very important. The trend is decreasing by 45%, but still the number of people is the highest- 375 250 persons (farming labour). In the other hand the number of persons employed in agriculture in category of non-family labour is increasing with 12% compared to 2010.

Table 5. Persons working on the holding by family relationship with the holder

Labour /Year	2010	2013	2016	% 2010/ 2016
Labour force	738,634	557,408	439,736	-40.5
Non-family	57,168	57,723	64,485	12.8
Family	681,466	499, 685	375,250	-45

Source: MAFF, Agrostatistics Department, DG ARP, FSS.

Table 6. Holdings by the other gainful activities carried out in the holding

Type of activity	2010	2013	2016
Provision of health, social or educational services			27
Agricultural mechanized services (ploghing, sowing, digging, harvesting etc.)	2,645	1,918	1,037
Non-agricultural mechanized services (snow-cleaning etc.)	255	283	285
Rural tourism (hotel and restaurant services)	145	106	138
Craftsmanship (pottery, weaving, cutlery etc.)	45	11	3
Processing of farm products (processing of agricultural products produced on the farm, processing of grapes for wine excl.)	307	376	312
Forestry	46	45	79
Wood processing	72	8	53
Production of renewable energy for the market (from wind, hydropower, biogas, etc.)	12	33	11
Production of fish and aqua-crops, please specify	5	98	11
Other gainful activities, please specify	108	268	137
Total	3,640	3,146	2,093

Source: MAFF, Agrostatistics Department, DG ARP, FSS.

Other important indicator is the efficiency of one employed person. Small farms up to 2 ha are having a 50% less efficiency per

employed person according to the big farms (own calculation by statistical data).

From the point of view of diversification of farms, it can be summarized that the total number of diversifying farms is unstable and in the most of the supplemented activities it is declining. The data is shown in Table 6.

The model of organic farms in Bulgaria for the period 2011-2017 show a tendency to increase certified organic production areas. In the 2017 the area of the organic production control system is 136,629 hectares, while in 2011 there were 26,622 hectares. The largest share are permanent meadows and pastures, perennial crops and technical crops. In 2017 the areas under control system occupy 2.72 % of the total utilized agricultural area in the country. For the same year the areas in transition are 87,122 ha.

CONCLUSIONS

Models of agricultural farms in Bulgaria are diverse by their different classification characteristics. The main conclusions are:

The total number of agricultural holdings in Bulgaria decreased from 370 thousand to 201 thousand.

Despite the decrease in the total number, the most numerous group is small farm with the predominant models of natural and semi-subsistence farms.

From economical point of view, the number of small farms in Bulgaria is decreasing, the most significant is that in the group with standard output up to 2,000 euros, which accounts nearly 60% reduction.

There is a tendency to increase the number of large farms, as in the largest group the increase reaches 77 %.

The total utilized agricultural area increases by 5% over the survey period, the amount of input labour is decreasing and output from production has increasing trend. This means that the efficiency of agricultural holdings is increasing.

The farms up to 2 ha are less efficient according to the big farms, which are reaching efficiency up to 92% by one person.

At this stage the diversification processes are not yet developed and is missing data for distribution between the type of farms.

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EFFICIENCY OF LAND MANAGEMENT PROVISION OF SUSTAINABLE LAND USE OF AGRICULTURAL

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Abstract

The article is devoted to the substantiation of theoretical-methodological approaches to assessing of effectiveness of land management for sustainable land use in agrarian sector. It is proved that when justifying the criteria for evaluating the effectiveness in this area, it is necessary to proceed from the basic provisions of the interaction of economic and environmental subsystems that determine the interests of society and the interests of the business entity. To assess the effectiveness of land management, a method for calculating the integral indicator that integrates the system of environmental and economic indicators in this area has been proposed. According to the integral indicator, four groups of clusters are formed in terms of the effectiveness of land management provision: first group is the most efficient management; second group is the level of efficiency above the average; third group is the level of efficiency below the average; fourth group is inefficient management. The proposed method involves the use of a matrix method for assessing the effectiveness of management for ensure sustainable use of land. The advantage of the proposed approach is that it allows you to determine how to effectively or ineffectively optimize land resources at the regional district level, which ensures relative comparability of the calculated indicators. Approbation of the proposed methodology for assessing has proved that state authorities, as well as business entities can take adequate management decisions, and the effectiveness of land use by agrarian producers can be improved.

Key words: *efficiency, assessment, land management, provision, sustainable, agricultural, integral indicator.*

INTRODUCTION

Land resources are the main means of agrarian production, and the process of their use in economic activities ensures the socio-economic development of the country. Stable land use plays an important role in this, which in turn is impossible without effective land management. However, in the process of reforming land relations, the use of agricultural land became one of the most acute problems of a market economy.

In all major areas of state control over the conduct of land management operations, it is necessary to ensure the availability of stocks and conduct monitoring over the protection of land. It is noted that the administrative-territorial functions for the ward regime in the country should be coordinated with the necessary documents, including for the embassy in the country.

In modern market conditions, one of the primary tasks of increasing the economic effectiveness of land use in agrarian sector is the formation of optimization of management decisions in this area. Therefore, one of the most pressing issues is the scientific substantiation of the methodology for assessing the effectiveness of land use management to ensure the supportable use of agricultural land.

An effective land governance process for agrarian land must take into account the current social conditions and economic relations and ensure the beginning of a civilized land market, the stability of land rights, complete and accessible information support for regional development planning. This will make it possible to reduce the development of monopolies and latifundia in agriculture, which impede the provision of sustainable land use. The priority task of land governance science is to change the direction of development of land governance design of the territories of agrarian formations.

With the development of new forms of

management and methods of organizing the territory, the issues of establishing criterion indicators for determining the degree of land management for supportable use of land resources taking into account environmental requirements are put in the forefront [2; 6; 11-13]. In the theory of economic performance, there are "criteria" and "indicators". Efficiency criteria characterize its qualitative side, the correspondence of the result of activity to the goals that define this activity. A quantitative reflection of these criteria is expressed in the relevant indicators. In particular, such indicators include: yield, capital productivity, costs per unit of production, as well as indicators of profitability and indicators of improving the quality of land resources and their fertility.

In the process of functioning of land governance mechanism, is inextricably linked with the formation of stable use of land, it is necessary to be guided both by generally accepted (in particular, regulatory and legal) provisions, and a number of requirements and principles reflecting the features of this ecological-economic process. In particular, an important environmental and economic imperative of land use support is territory use planning.

The purpose of land management regulation is the establishment of obligatory qualitative and quantitative indicators (standards) aimed at ensuring the sustainable use, protection and reproduction of land, as well as ensuring environmental safety in land relations [7].

From the point of view of public interest, indicators of land use effectiveness is to meet the needs of the population in agricultural products at the expense of domestic production. From the point of view of the economic interests of producers, efficiency consists in obtaining the maximum profit per unit of invested capital, and the economic interests of consumers in improving the quality and lowering prices for agrarian products.

Considering that land resources are a natural object, as well as an object of land relations, we propose to divide the effectiveness of land management into the following types: ecological and economic. Ecological efficiency characterizes created as a result of management provision of land resources and other elements of the natural environment and their improvement, reproduction of soil fertility, prevention and suppression of ground degradation processes, water erosion, deflation and other negative phenomena. Economic efficiency takes into account the effectiveness of land use measures to ensure their use in monetary terms. It can be expressed as the ratio of the valuation of the results in the valuation of resource expenditures over the entire duration of the activities, taking into account the time factor. At the same time, compulsory compliance with environmental and social requirements, which are also evaluated as ancillary economic effect or costs, must be ensured.

MATERIALS AND METHODS

Effective functioning of a land management system is impossible without a comprehensive presentation of the results of land organization activities, therefore, the initial element of its support system is an effectiveness analysis. The need for analytical evaluation of efficiency is indisputable, because its results are the basis for making management decisions that allow you to choose the optimal strategy, tools and methods in the framework of land management provision for land use.

Considering this, the important issues are the selection of criteria and indicators for such an assessment, which will most objectively reflect the level of land management.

The priority of one or another criterion of efficiency depends on the specific conditions of management, the level of development of the productive forces. The application of the criteria of environmental and economic effectiveness allows us to provide an assessment of land use forms of complexity. These criteria create restrictions for methods of obtaining profit or income from using land as a natural resource, and also provide an opportunity to form a system of rational and at the same time balanced land use.

Analysis of materials and literature [1; 3; 9;

16] leads to the following conclusion: the bias of many methodologies for assessing the effectiveness of land use lies in the various dimensions of absolute and relative indicators. Absolute indicators illustrating trends in land structure changes provide an opportunity to assess the degree of intensity of land use. Relative indicators, including performance indicators of 1 hectare of agricultural land, characterize the efficiency of potential use. However, in our opinion, it is necessary to evaluate both groups of indicators, because the effectiveness of management directly contributes to the ecological status of land resources, and vice versa.

From the point of view of the level of economic effectiveness of agricultural production should be considered not only as the ratio of results to costs. First of all, it is necessary to evaluate the possibility of using the available resources subject to obtaining the maximum result. This approach primarily provides an opportunity for a real comparative assessment of the achieved and expected results. In addition, it provides an opportunity to clarify the amount of lost profits, as well as to conduct a fair comparison of the performance of economic entities, regardless of their size, specialization and location [16, p. 213].

In general, justifying the criteria for the ecological and economic assessment of land management, it is necessary to proceed from the basic provisions of the interaction of economic and environmental subsystems that determine the interests of society and the interests of a business entity [4; 8; 12]. Criteria for assessing the interaction of economic and environmental subsystems should reflect the fullest set of interactions that embodies the economic and environmental objectives.

The effect of land management cannot be assessed only by the ratio of project costs and future cost reduction, because some of the effects are ultimately revealed by improving the quality of land management, and the manifestation of a number of positive factors deferred over time due to lower costs due to better land management.

Having considered various methodologies for assessment of effectiveness of land management, we have formed a set of environmental and economic indicators used to assess sustainable land use in agrarian sector (Table 1).

One of the main results of the implementation of any land management project is the increase in agricultural production, the proceeds from the implementation of which determines the incremental financial flows in evaluating its effectiveness. Therefore, special attention should be paid to the question of justifying the productivity of land-land, which is a fundamental factor in the formation of technical and economic indicators of an investment project in land management in agrosphere.

Table 1. The main indicators of efficiency of land management provision of sustainable land use of agricultural

Indicator	Criterion of optimality
Economic	
Increase productivity agrolandscapes, conventional units	Max
Land transfer coefficient, units	Max
Cost recovery, units	Min
Additional income as a result of cost reduction, conventional units	Max
Budget efficiency of land management	Min
Environmental	
Coefficient of ecological stability of territories, units	Max
Tension of relief, %	Min
Coefficient of technogenic land destruction, units	Min
Dynamics of soil bonitet score, %	Max
Motley land, units	Min
Degree of soil erosion, %	Min

Source: systematized by the author based on [3; 5; 13-15].

The set of indicators proposed by us for assessing the effectiveness of land management for the sustainable use of agricultural land demonstrates their multifactorial nature and interdependence in questions of optimization, which leads to the need to develop management decision-making measures.

When improving and systematizing the

environmental and economic indicators for evaluating the effectiveness of land management to ensure the stability use of land in agrarian sector, we proceeded from the following: the level of ecological and economic efficiency of land use and the availability of the necessary natural resource potential create prerequisites for its improvement; the process of land use must reproduce the specific result that occurs during land management; the environmental and economic efficiency of land use must necessarily take into account the peculiarities of the reproduction process in agrarian production.

The proposed method involves the use of a matrix method for assessing the effectiveness of land management security of use of agricultural land in the context of sustainable development, which is supplemented by the solution of the problem of dimensional differences and the application of selection criteria. At the first stage, the necessary information for the assessment is collected. At first, clustering is conducted on a territorial basis (regions, districts, zones, etc.). To compare different types of land in agrosphere it is necessary to transfer hayfields and pastures into conditional arable land.

For the formation of the basic indicators necessary for the implementation of the proposed methodological approach, we use information for a three-year period in order to minimize the influence of natural factors and market conditions.

At the second stage, the proposed performance indicators are calculated. The matrix on the absolute values of the indicators of the effectiveness of land management for the sustainable use of agricultural land is formed according to the results of the calculation of evaluation criteria by groups of economic and environmental parameters for each alternative considered. The solution of the obtained matrix provides for the elimination of the differences in the dimensions of the reduced parameters, that is, their translation into a dimensionless form [10]. To do this, the absolute values of the indicators are replaced by the degree of their achievement:

$$K_i = i_1 + i_0, \quad (1)$$

i_1, i_0 – the current value of this indicator and the base value for a given species, which is the desired, in terms of optimization conditions (maximum or minimum) value.

In the modern conditions of agrarian production, in order to assess the ecological and economic effectiveness of land management in agricultural, a need has arisen for an integral indicator that would reflect the efficiency of land use from the standpoint of realizing the soil potential and its market value. In this regard, to assess the effectiveness of land management to ensure the sustainable use of agricultural land, we proposed an integral indicator:

$$I_{ef} = \sqrt[i]{\sum K_i}, \quad (2)$$

The integral indicator of assessment and indicators of environmental and economic efficiency, which are its constituent elements, make it possible to fully reflect the effectiveness of land management to ensure the sustainable use of agrarian land.

It is worth noting that in order to select the most significant factors influencing the resultant attribute of an integral indicator, a correlation analysis can be applied; it involves measuring the degree of connection between them.

RESULTS AND DISCUSSIONS

The environmental and economic effect of land management projects is determined by increasing yields, reducing the cost of processing crops, reducing or restoring soil fertility, protecting the soil from loss of soil due to erosion, forest reclamation measures, and preventing damage from anthropogenic factors.

In order to test the proposed methodological approach, we calculated an integral indicator of land management provision sustainable

land use of agricultural in the administrative districts of Lviv region. Averages are calculated over three years, which is associated with fluctuations in crop yields, which is due to a significant discrepancy in natural climatic conditions and market conditions.

In table 2 shows the results obtained by our proposed methodological approach in the ranked order, according to the ecological and economic efficiency of land management to ensure the sustainable use of agricultural land in the administrative districts of the Lviv region. At the same time, during the formation of clusters, the correspondence of the obtained results to normal distribution was taken into account so that the distribution of areas into groups occurred adequately and it was possible to carry out economic and statistical analysis methods.

Table 2. Efficiency of land use management for sustainable agricultural land use of Lviv region, 2015-2017

District	K_{econ}	K_{ecol}	I_{ef}
First group (from 0.76 to 1)			
Stryiskyi	0.94	0.71	0.82
Sokalskyi	0.87	0.68	0.77
Kam`ianka-Buzkyi	0.90	0.66	0.77
Drohobytskyi	0.75	0.78	0.76
Second group (from 0.51 to 0.75)			
Radekhivskyi	0.77	0.59	0.67
Zolochivskyi	0.82	0.41	0.58
Buskyi	0.78	0.35	0.52
Brodivskyi	0.76	0.35	0.52
Yavorivskyi	0.72	0.38	0.52
Third group (from 0.26 to 0.50)			
Zhydachivskyi	0.68	0.35	0.49
Turkivskyi	0.17	0.88	0.41
Mykolaivskyi	0.51	0.31	0.40
Sambirskyi	0.52	0.28	0.38
Skolivskyi	0.16	0.79	0.36
Peremyshlianskyi	0.32	0.41	0.36
Mostyskyi	0.37	0.33	0.35
Pustomytivskyi	0.37	0.32	0.34
Horodotskyi	0.25	0.40	0.31
Zhovkivskyi	0.24	0.41	0.31
Fourth group (from 0 to 0,25)			
Starosambirskyi	0.14	0.42	0.24

Source: author's calculations.

As a result, we have identified four groups of clusters on the effectiveness of land management to ensure the sustainable use of agricultural land: the first group is the most efficient land tenure; the second is the level of efficiency above the average oblast; the third is the level of efficiency below the average oblast; the fourth group is inefficient land management.

The advantage of the proposed approach is that it allows you to determine how to effectively or inefficiently streamline land resources at the regional district level, ensures relative comparability of calculated indicators.

In some districts of the Lviv region, a situation has arisen where areas with relatively high environmental criteria (for example, bonitet score, ecological stability) have low or sometimes low profitability of production, that is, they use land resources ineffectively. At the same time, there are also opposite cases: with medium and even lower values, the bonitet score gives manufacturers quite high economic indicators.

This situation creates the threat of the formation of intense negative effects in the agrarian sphere of Lviv region, because the lack of an appropriate response to the acceleration of destructive soil processes leads to an increase in the level of danger for the food industry and the environmental sustainability of the region as a whole.

In general, the results obtained in the course of the study allow not only to reveal the mechanism for improving the efficiency of the entire industry due to its modernization, but also create the basis for its reasonable leading role in relation to other industries with spatial reference.

CONCLUSIONS

Having approbation the integral indicator of land management provision of land use of in the context of sustainable development of agricultural, we can talk about the relevance of its use in practice, because it allows state authorities, as well as business entities and investors to take adequate management decisions and improve the effectiveness of land use by agricultural producers.

It should be noted that increasing the efficiency of land use in agrosphere is

possible only by applying a systematic approach. The land governance system approach is expressed in the sustainable use of agro-ecosystems and their natural resources. Therefore, the basis of a balanced use of land resources is the choice of the most effective option for their use, in terms of solving certain environmental and economic priorities. In turn, the use of land for a specific purpose should also be the most efficient of all possible options.

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INPUTS ACCESSIBILITY AND EFFECTIVENESS OF GROWTH ENHANCEMENT SUPPORT SCHEME (GESS) IN SOUTHWEST NIGERIA

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Abstract

The study assessed the level of accessibility of inputs through GESS and analyzed the structure and operations of the Growth Enhancement Support Scheme (GESS) on input supply to small-scale farmers in Southwestern Nigeria so as to examine the effectiveness of GESS in Southwestern Nigeria. A multistage sampling technique was employed in selecting 420 GESS farmers from three states in the southwestern zone namely: Osun, Ondo and Ogun. Validated and pretested interview schedule was used to collect quantitative data from the small-scale farmers. Data collected were described with frequency counts, percentages, mean scores and standard deviation. Chi-square and Correlation analyses were used to draw inferences from the hypotheses. Results showed that the mean age of the small-scale farmers was 49.57±10.49 years and a high level, 75.70 percent were males. All the respondents (100.00%) showed low level of access to inputs. Analysis of the structure and operations of GESS on input supply showed that GESS was structured and operated by the government among the various stakeholders using the top-down approach. Out of the nineteen GESS effectiveness indicators, none was effective at solving the problems of inputs delivery to the respondents. Chi-square analysis showed a significant association between the effectiveness of GESS and respondents' sex ($\chi 2=46.159$; $p\leq 0.01$). Correlation analysis also showed a positive and significant relationship between effectiveness of GESS and accessibility of farm inputs ($r=0.222$; $p\leq 0.01$). It was concluded that GESS recorded a low level of effectiveness of GESS in the study area as a result of low level of accessibility of agricultural inputs through GESS. The study therefore recommends that quantity of input supply be increased and that more inclusive participatory approach instead of top-down approach should be adopted for planning, execution and evaluation of the GESS programme.

Key words**:** *inputs accessibility, effectiveness, Growth Enhancement Support Scheme (GESS)*

INTRODUCTION

Over 80 percent of the farming population in Nigeria is smallholders residing mostly in rural areas. (Anaman, 1988) in Afolabi J. A. (2010) [3] disclosed that small farms are mainly responsible for self-sufficiency of food in Africa and cultivation of export crops. They are also very significant in the world's development with 50 percent of world's population depending on them. Howbeit, the average Nigerian small-scale farmer is illiterate, poor, and does not have access to modern farming implements and improved varieties of inputs; these have resulted in low production and the slow rate of productivity (Opara, 2010) [7]. According to Upton (1972) in Obayelu, Afolami and Agbonlhor (2013) [10], farm sizes classification of less than 5ha should be classified as small, between 5 ha and 10 ha as medium, and more than 10ha as large scale. Nigerian government since independence in 1960 had established and launched several policies development and improvement of farmers' access to means of production such as fertilizer, agro chemicals and hybrid seeds. However, the implementation of those policies/programmes has been faced with several challenges which led to results that were either unsatisfactory or unintended. The GESS was implemented to remove the difficulties usually associated with the distribution of agricultural inputs in the country and encourage critical actors in the inputs value chain to work together to improve productivity and enhance farmers' income. The quality and quantity of inputs were determined by the Federal Ministry of

Agriculture and Rural Development (FMARD). Registration precedes access of input by farmers. After registration, SMS are sent out to farmers on a day called "roll out day". The message specifies the center and the input (every farmer has been coded to a center). When a farmer that has a functional phone receives the GESS SMS, he/she goes to the designated redemption center, the help line staff (employed by Cellulant) looks at the message, uses the phone of the farmer to dial with a particular number to Abuja, when the confirmation comes, the farmer is able to redeem. Whatever transaction takes place at the redemption center must reach the table of the technical partner (Cellulant). After reconciliation, whatever Cellulant says it sees is what the FMARD will pay the Agro dealer for. For a particular value chain, redemption could be for 4 weeks (usually before the planting season commencement) and may be extended for two weeks. Because of the enormousness of the work at the redemption center, other agents were introduced; the supply chain manager/help line staff. This study was therefore embarked upon to assess the effectiveness of GESS's e-wallet approach in grassroots agricultural inputs delivery in Southwestern Nigeria.

Objective of the Study

The broad objective of the study was to assess the effectiveness of GESS in Input Delivery in Southwestern Nigeria.

The specific objectives of this study were to;

a.) describe the personal and socio-economic characteristics of the respondents;

b.) assess the level of accessibility of inputs through GESS; and

c.) analyze the structure and operations of GESS on input supply.

Research Hypotheses

The following research hypotheses stated were also tested.

Ho1: There is no significant relationship between the effectiveness of GESS and the respondents' personal and socio-economic characteristics.

Ho2: There is no significant relationship between the effectiveness of GESS and the level of accessibility of inputs to the respondents.

MATERIALS AND METHODS

The study area was southwest geopolitical zone of Nigeria. A multistage sampling technique was employed in selecting 420 GESS farmers from three states in the southwestern zone namely: Osun, Ondo and Ogun. At the second stage, proportionate sampling technique was used to select 20 percent of all the Local Government Areas (LGAs) in the 3 States. In other words, 6 LGAs were selected in Osun, 4 in Ondo and 4 in Ogun States, making a total of 14 LGAs. At the third stage, using purposive sampling technique, 3 rural communities each were selected in the LGAs making a total of 42 rural communities. At the fourth stage, simple random sampling technique was used to select ten small-scale farmers making a total of 420 GESS farmers. Validated and pre-tested interview schedule was developed and used to collect quantitative data on farmers' personal and socio-economic characteristics, assessment of the level of accessibility of inputs through GESS, and evaluation of the effectiveness of GESS in solving the problem of inputs delivery to the respondents. Information on the structure and operations of GESS on input supply was collected from the States' GESS coordinators and desk officers and three different agro-dealers selected from the three states. Frequency counts, percentages, mean, weighted mean, standard deviation and equal intervals were used to summarize and describe the data collected. Inferential statistics such as Chi-square and correlation analyses were used to test the hypotheses formulated.

RESULTS AND DISCUSSIONS

Personal and socio-economic characteristics of the respondents

Results in Table 1 show that the mean age of the respondents was 49.57, this indicates that most of the respondents were still young and are expected to be active in keying into the

GESS e-wallet approach and thus make effective utilization of the scheme to enhance their productivity. Majority, 75.70 percent of the respondents were males. This finding agrees with that of Umar et al., (2015) [9] which revealed that the respondents in the study area were largely male (78.9 percent). This result could be because it was the season of GESS, a special programme that bordered on inputs procurement and this task of inputs acquisition could be said to be largely male's task and that the men procure the inputs and may give some to their wives (who are also farmers). The years of farming experience of the respondents ranged from 1 to 54 years with a mean of 20.5 years. These findings agree with that of Nwaobiala and Ubor (2016) [6] which revealed that the mean of years of farming experience among GESS farmers was 16.5 years. This show that most of the respondents had relatively large number of years of farming experience and that they were expected to be active in keying into the GESS approach and thus make effective utilization of it in accessing inputs for their farming activities. Majority, 68.80 percent of the respondents owned a functional mobile phone. This result could be because it was the season of GESS and ownership of a functional mobile phone with registered SIM card is one of the prerequisites for being registered as a GESS farmer and this is expected to boost the farmers' access to firsthand information about the availability and accessibility of farm inputs through GESS. This finding is in line with that of (Adebo, 2014) [1] who reported that the majority of GESS farmers sampled possessed mobile phones. Majority, 58.8 percent of the respondents became aware of GESS through Extension agent/ADP. This implied that Extension agent/ADP is still one of the best media of reaching farmers at the grassroots. The result agrees with that of (Adebo, 2014) [1] which revealed that the majority of the GESS farmers sampled indicated that they got their information from ADP and extension agents.

Table 1. Distribution of respondents by personal and socio-economic characteristics (n=420)

Variables	Frequency	Percentage	Mean	Standard Deviation
Age in years				
30	22	5.3	49.57	10.49
31-60	337	80.2		
61 and over	61	14.5		
Sex				
Male	318	75.70		
Female	102	24.30		
Years of farming experience				
1-15	164	39	20.5	10.86
16-30	196	46.7		
31 and over	60	14.3		
Functional mobile phone ownership				
Yes	289	68.8		
No	131	31.2		
Source of awareness of GESS				
Extension agent/ADP	247	58.8		
Television	5	1.2		
Radio	58	13.8		
Fellow farmers	100	26.2		

Source: Field survey, 2015.

Results in Figure 1 show that show that a little close to average, 48.10 per cent of the respondents got the land used for farming activities through inheritance while few, 37.14 per cent purchased the land, 11.67 per cent got the land through lease, 2.38 per cent got the land as gift and 0.71 per cent got the land through pledge. The findings indicated that most of the farmers acquired their farmland by inheritance. This implied that most of them

must have been indigenes of the various communities within the study area. This result agrees with the findings of (Adebo, 2014) [1] who found out that the source of land used for planting by most of the GESS farmers sampled was through inheritance.

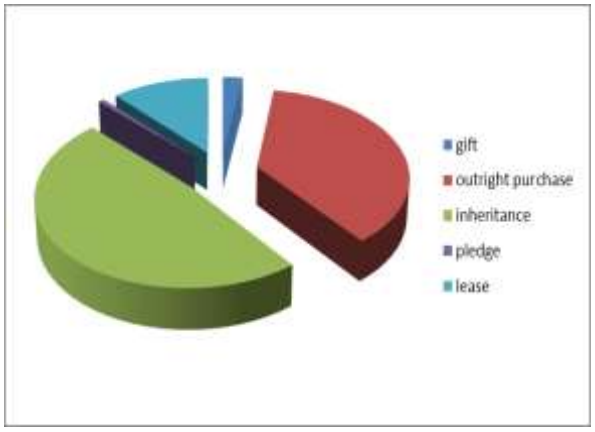

Fig 1. Pie chart showing the distribution of respondents by farmland acquisition pattern
Source: Field survey, 2015.

Assessment of level of accessibility of inputs through GESS

Results in Table 2 show the mean scores of the accessed inputs, NPK fertilizer (1 bag) had a mean score of 2.44, UREA fertilizer (1 bag) had a mean score of 2.32, improved maize seeds (10 kg) had a mean score of 1.80, and improved rice seed, (15 kg) had a mean score of 0.20. None of the farmers accessed 25 bundles of improved variety of Cassava stem cuttings, Special Cassava NPK fertilizer, Acatara, Champ DP, Funguran, Ridomil, Ultimax, 2 bags of fertilizer (Teractive), 50 units of improved oil palm seedlings, 1 litre of herbicide, ¼ bundle of wire collar, one bag of N P K fertilizer (75kg), 500 Juvenile (fish), 5 bags of fish feed, 100 Day Old Chicks (Broilers), 3 (50kg) bags of feed, 400 doses of New Castle vaccine, 2 sachets of Vitalite, 2 sachets of Coccidiostat, 2 (50kg) bags of feed for sheep/goat, 10ml of ecto-parasite drug for sheep/goat, 10bowls of Dewormer, 5kg of salt lick, 3 piglets, 10 bags of feed for pigs, 10 litres of disinfectant for pigs, 10 (50kg) bags of beef fattener, 10kg of salt lick. From the scales of measurement of 1, 2, and 3 of rarely accessed, often accessed and always accessed, the accessed inputs whose means measure up to rarely accessed, often accessed and always accessed, that is, approximately 1, or 2 or 3 were used as benchmark for access to inputs. This means that out of the four inputs accessed by the small-scale farmers, two; NPK fertilizer (1 bag) and UREA fertilizer (1 bag) were often accessed and improved maize seeds were approximately often accessed. These results further show that all the inputs accessed by the farmers were in the generic category and that none of the inputs in the specific category was accessed, this might have been because majority of the sampled farmers were arable crop farmers and further infer that any intervention that would be applied to improve the accessibility of inputs through GESS by the respondents in the study area should be applied to bring about improvement in accessibility of all the inputs for farm enterprises that the respondents engage in and more especially the specific inputs.

Table 2. Mean scores of accessed inputs through GESS by small scale farmers (n=420)

S/N	Inputs	Mean scores
1	NPK fertilizer (1 bag)	2.44
2	Urea fertilizer (1 bag)	2.32
3	Improved maize seeds (10kg)	1.80
4	Improved rice seeds, (15kg)	0.20
	Grand Mean	6.76
	Standard Deviation	4.12

Source: Field survey, 2015.

Level of accessibility of inputs through GESS

Results in Table 3 show that all, 100.00 per cent of the respondents were at low level of accessibility of inputs through GESS. This result agrees with that of Umar et al., (2015) [9] which revealed that inadequate quantity of fertilizer was accessed by beneficiaries. The result also agrees with that of (Adebo, 2014) [1] which revealed insufficient fertilizer and seed supply to the beneficiaries.

Table 3. Distribution of respondents by level of accessibility of inputs (n=420)

Level of accessibility	Values	Frequency	Percentage
High	≥65	0	0.0
Moderate	33-64	0	0.0
Low	≤32	420	100.0
Total		420	100.0

Source: Field survey, 2015.

Analysis of the Structure and Operations of GESS on Input Supply

The rundown of the analysis of the Structure and Operations of GESS on Input Supply through the Agro-dealers, the States' GESS Coordinators and Desk Officers show that GESS is structured and operated by the government among the various stakeholders using the top-down approach. These findings agree with that of (Adebo, 2014) [1] who recommended that the government should embrace participatory approach in the GESS project planning, implementation and evaluation after 5 years to tackle all the teething problems.

Evaluation of the effectiveness of GESS in solving the problem of inputs delivery to the respondents.

Results in Table 4 show the statements on the effectiveness of GESS in solving the problem of inputs delivery to the respondents. The results show that the respondents (MS=0.98) chose registration of farmers as an effectiveness indicator of GESS in solving the problems of access to inputs, also, respondents (MS=0.93) chose existence of nearby GESS redemption center, respondents (MS=0.86) chose availability of up to date GESS farmers' register, respondents (MS=0.69) chose good network for reception of electronic messages/alert from Cellulant before or during farming season, while respondents (MS= 0.48) chose timely dissemination/reception of information/electronic messages/alert. Also, respondents (MS=0.39) chose access to agricultural inputs through GESS with the assistance of supply chain representatives/help line staff and respondents (MS=0.38) chose reduction of chances of loss of plants/livestock as a result of use of good quality agricultural inputs as effectiveness indicator of GESS in solving the problems of access to inputs.

Table 4. Effectiveness of GESS in solving the problems of access to inputs by small-scale farmers (n=420)

S/N	Effectiveness statements	Mean scores
1	Prompt registration of farmers	0.98
2	Existence of nearby GESS redemption center	0.93
3	Availability of up to date GESS farmers' register	0.86
4	Good network for reception of electronic messages/alert from Cellulant	0.69
5	Timely reception of information/electronic messages/alert	0.48
6	Access to required quality agricultural inputs	0.42
7	Access to agricultural inputs through GESS with the assistance of supply chain representatives/help line staff that facilitate redemptionof agricultural inputs at the redemption center.	0.39
8	Reduction of chances of loss of plants/livestock as a result of use of good quality of agricultural inputs.	0.38
9	Access to agricultural inputs through GESS before or during farming season	0.34
10	Access to agricultural inputs through GESS without interference of middle men and political elites	0.33
11	Access to required quantity agricultural inputs through GESS ncreased productivity	0.32
12	Increased income	0.30
13	Reduced cost of production	0.30
14	Access to agricultural inputs through GESS at affordable prices	0.29
15	Reduction of chances of loss of plants/livestock as a result of use of sufficient quantity of agricultural inputs	0.28
16	Increased productivity	0.27
17	Access to some of the agricultural inputs free of charge	0.25
18	Improved standard of living	0.24
19	Conservation of time and energy	0.23

Source: Field survey, 201.

Others were access to agricultural inputs through GESS before or during farming season (MS= 0.33), access to agricultural inputs through GESS without interference of

middle men and political elites (MS=0.33), access to required quantity of agricultural inputs through GESS (MS= 0.32) and increased income (MS= 0.33), access to agricultural inputs through GESS at affordable prices (MS= 0.30), reduced cost of production (MS= 0.29), reduction of chances of loss of plants/livestock as a result of use of sufficient quantity of agricultural inputs (MS= 0.28), increased productivity (MS= 0.27), access to some of the agricultural inputs free of charge (MS= 0.25), improved standard of living (MS= 0.24) and conservation of time and energy (MS= 0.23).

From the scales of measurement of 1, 2 and 3 of less effective, effective and very effective respectively, indicators of effectiveness whose means measure up to effective or very effective, that is, approximately 2 to 3 were used as benchmark for the GESS effectiveness. This means that out of the nineteen GESS effectiveness indicators, none was effective at solving the problems of inputs delivery to the respondents. This shows that the GESS has not effectively addressed the problems of input delivery to the respondents in the study area. This result further infers that any intervention that would be applied to improve the effectiveness of GESS in solving the problem of inputs delivery to the respondents in the study area should be applied to bring about improved standard of all the indicators of effectiveness identified above.

Results of Hypotheses Testing

Hypothesis one: There is no significant relationship between effectiveness of GESS and selected personal and socio-economic characteristics of the respondents. Results in Table 5 show significant association between the effectiveness of GESS and sex ($\chi 2$=46.159, p≤ 0.01) and farmland acquisition pattern ($\chi 2$=145.98, p ≤ 0.01). Sex had a significant association with the effectiveness of GESS. This implied that the effectiveness of GESS varies between male and female farmers. This may be due to the fact that male farmers have the tendency to have more farmland, hence get engaged in farming more than their female counterparts considering the point that most developing countries culturally give priority to male in land ownership than female as opined by (Alice, 2008 and Lawanson, 2010) [5] that women are culturally hindered from owing farmland in most African countries. This result might also be due to the fact that the majority, 75.70 percent of the respondents as observed from the study were males who might be assumed to be physically active engaging in different economic livelihood activities. This implied that the higher the number of male GESS farmers, the higher the effectiveness of GESS in solving the problems of access to inputs. Farmland acquisition pattern also had a significant association with the effectiveness of GESS. This implied that the effectiveness of GESS varied among farmers based on their farmland acquisition pattern. This might also be due to the fact that close to average, 48.10 percent of the respondents as observed from the study got the land used for farming activities through inheritance. This result shows that acquisition of land used for farming activities through inheritance will favor an effectiveness of GESS, meaning that the more the GESS farmers acquire land used for farming activities through inheritance, the higher the likelihood of accessing and utilizing information on GESS effectively. The implication of these findings is that sex and farmland acquisition pattern should be considered by GESS value chain actors/stakeholders for the achievement and enhancement of the effectiveness of GESS in solving the problems of inputs delivery in the study area. Results of correlation analysis between the effectiveness of GESS and some selected personal and socio-economic characteristics of the respondents is shown in Table 6. The result shows that age had a significant but negative relationship with the effectiveness of GESS (r= -0.253; p≤ 0.01).

This might be due to the fact that the majority, 80.20 percent of the respondents as observed from the study were 31-60 years, that is, were still young and were expected to be active in keying into the GESS. This result agrees with the findings Oyediran *et al*., (2014) [8] which

revealed that age was negatively correlated to the farmers' attitude on the GESS. This might be because GESS employed modern innovative approach as in the use of ICT (in form of e-wallet) which were more youth-friendly. Such could make the elderly skeptical, less comfortable and, therefore, not make effective use of it. The negative relationship also indicates that the younger the GESS farmers are, the higher the likelihood of making effective utilization of the GESS to enhance their productivity. Frequency of contact with extension agents had a significant and positive relationship with effectiveness of GESS (r=111; p≤ 0.05). This might also be due to the fact that the majority, 67.5 percent of the respondents that had contact with extension agents had the contact with extension agents twice a month. This finding is in contrast with the findings of Umar et al., (2015) [9] which revealed a negatively significant relationship between extension visit and GESS satisfaction. This result implied that an increase in frequency of the contact will lead to an increase in favor of effectiveness of GESS. This result is expected because the more the respondents have contact with extension agents the more their likelihood of accessing and utilizing information on GESS that could enhance their productivity. Years of farming experience also had a significant and positive relationship with effectiveness of GESS (r=0.255; p≤ 0.01). This might also be due to the fact that most of the respondents as observed from the study had relatively extensive farming experience. This result agrees with the findings of Fadairo *et al*., (2015) [4] which revealed a positive relationship between attitude of farmers towards GESS and years of farming experience. The result also agrees with the findings of Umar et al., (2015) [9] which revealed that the level of satisfaction with GESS increased among families with higher farming experience.

This implied that an increase in years of farming experience will lead to an increase in favor of the effectiveness of GESS. Functional mobile phone ownership also had a significant and positive relationship with effectiveness of GESS (r= 0.344; p≤ 0.01). This implied that an increase in functional mobile phone ownership will lead to the increase in effectiveness of GESS. This might be due to the fact that as observed from the study, the majority, 68.80 percent of the respondents owned functional mobile phone and this was expected to boost their access to the farm inputs through the GESS as ownership of a functional mobile phone with registered SIM card is one of the prerequisites for being registered as a GESS farmer and receive an alert about the accessibility of farm inputs. The implication of these findings is that age, frequency of contact with extension agents, years of farming experience and functional mobile phone ownership should be considered by GESS value chain actors/stakeholders for the achievement and enhancement of the effectiveness of GESS in solving the problems of inputs delivery in the study area.

Table 5. Chi-square analysis showing the association between the effectiveness of GESS and some selected personal and socio-economic characteristics of the respondents

Variables	χ2-value	df	p-value
Sex	46.159**	19	0.000
Marital status	88.591	76	0.153
Religious affiliation	27.068	38	0.907
Farmland acquisition pattern	145.98**	76	0.000

** Significant at 0.01 level, * Significant at 0.05, χ2 = Chi- square value, df: Degree of freedom
Source: Field survey, 2015.

Hypothesis two: There is no significant relationship between the effectiveness of GESS and the level of accessibility of inputs to the respondents. To test this hypothesis, bivariate correlation was used. The results in Table 7 show positive and significant relationship between effectiveness of GESS and accessibility of inputs (r=0.222, p≤ 0.01). This result is an indication that increase in accessibility of farm inputs will lead to an

increase in the favour of effectiveness of GESS in the study area. This result is expected as provision of affordable agricultural inputs like fertilizer, hybrid seeds and agro-chemicals to farmers is one of the main objectives of GESS. The contribution of access to inputs vis a vis effectiveness of GESS was 4.93 per cent. This low value of percentage contribution could be because most of the inputs were not accessed by the respondents; hence, the percentage contribution of access to inputs to GESS effectiveness was low.

Table 6. Summary of correlation analysis between effectiveness of GESS and some selected personal and socio-economic characteristics of the respondents (n=420)

Variables	Correlation coefficient	Coefficient of determination
Age	-0.253**	0.064
Total household size	0.052	0.003
Contact with extension agents	0.000	0.001
Frequency of contact with extension agents	0.111*	0.012
Cosmopoliteness	0.050	0.025
Annual income from farming	0.006	0.000
Years of farming experience	0.255**	0.065
Functional mobile phone ownership	0.344**	0.118

** Significant at 0.01 level, * Significant at 0.05 level, df: Degree of freedom
Source: Field survey, 2015

Table 7. Correlation analysis between effectiveness of GESS and accessibility of farm inputs to the respondents (n=420)

Variable	Correlation coefficient (r)	Coefficient of determination (r^2)
Accessibility of farm inputs	0.222**	0.049

**Significant at 0.01 level.
Source: Field survey, 2015.

CONCLUSIONS

The study concluded that there was high level of identified problems of access to inputs by the respondents, GESS was structured and operated by the government among the various stakeholders using the top-down approach, also there was low level of accessibility of inputs through GESS by the respondents, and low level of effectiveness of GESS in solving the problem of inputs delivery.

Based on the findings and conclusions from the study, the following recommendations were made.

•More inputs should be made accessible by inputs suppliers to agro dealers then to farmers

•Since the farmers used mostly interpersonal communication, more agricultural extension agents should be involved in the GESS.

•Radio and television broadcasts of the programs in various Nigerian local languages should be increased most especially before the onset of each program.

•The Nigerian Communications Commission should be required to improve network coverage so as to enhance the reception of calls and electronic messages for accessing agricultural inputs by farmers.

•There should be better orientation for future likely programmes and a reorientation of the farmers about the GESS in which there will be more extensive sensitization and enlightenment, especially at the grassroots levels.

•A more inclusive participatory approach instead of top-down approach should be adopted for planning, execution and evaluation of GESS programme.

•More redemption centers should be created, to move the centers closer to the farmers in terms of distance to be trekked or covered and number of farmers queuing up for redemption of inputs.

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EVOLUTION OF THE ECONOMIC ACCOUNTS FOR AGRICULTURE

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Abstract

According to the data regarding the economic accounts for agriculture published on 16 November 2018 by Eurostat, (the Statistics Office of the European Union), the total agricultural production obtained in the European Union in 2017 was 6.2% higher than in 2016, amounting to 432.6 billion euro at basic prices.. In 2017, the equivalent of 56% of the value of the agricultural production generated was used for intermediary consumption, while the gross added value represented 44%. The present paper is looking at how a mathematical algorithm used to study the impact of the agricultural production on the GDP can represent a tool for analysing and assessing the evolution of the GDP..The conclusion of the article is that the current fluctuations of the agricultural production trigger variations of the GDP, which means that agriculture is maintaining its impact on the GDP.

Key words**:** *agricultural production, gross domestic product, national accounts, mean, dispersion, confidence intervals*

INTRODUCTION

The present article aims at analysing the economic accounts for agriculture starting from the data supplied by Eurostat for the countries which obtained the highest agricultural production in 2017, namely Germany, Italy, France, Spain, the Netherlands, UK, Romania and Poland.
It is worth mentioning that there is an interconnection among the four types of resources used in the agricultural processes, namely earth, technical equipment, labour and money. [6].
The economic development is measured using the GDP, an indicator which can also show how the countries in a certain region have evolved and what macro-economic activities they have performed, thus allowing for a comparison to be drawn among them.
The data published by Eurostat in November 2018, based on an analysis of the economic accounts for agriculture for the year 2017, show that the overall agricultural production of the European Union stood at 432.6 billion euro at basic prices, this representing an increase by 6.2% as compared to 2016. [5]
In 2017, the intermediate consumption accounted for the equivalent of 56% (or 244.1 billion euro) of the value of the agricultural production generated. The remaining 44% (or 188.5 billion euro) was represented by the GVA (gross added value), which is the difference between the value of the production and that of the intermediate consumption.
Lately, thanks to the development of knowledge, machinery and the chemical industry, agriculture has undergone notable changes. A comparison between the situation of the EU agricultural industry in two consecutive years (2016 and 2017) reveals a substantial growth of the value of the agricultural production. This, combined with a marginal rise of just 1.8% of the intermediate consumption, led to a significant increase of the GVA by 12.4% in 2017 as compared to 2016.

Of all the EU Member States, France ranked first in terms of agricultural production, with 72.6 billion euro in 2017, representing 17% of the total. The second place was occupied by Germany with 56.2% (or 13%), followed by Italy with 55.1 billion euro and Spain with 50.6 billion euro.

The agricultural production of the UK was almost 20 billion euro less than that of Spain, standing at 31.8 billion euro. Next came the Netherlands, which obtained a total agricultural production worth 28.9 billion euro. On the last two places in this top were Poland (24.9 billion euro) and Romania (17.5 billion euro). [7]

In a rapidly changing world, the EU wants to become a smart, sustainable and inclusive economy [8]. In almost all the EU Member States, the value of the agricultural production increased in 2017. The country which experienced the highest growth was Estonia (up by 18.2%), followed by Ireland with a 13.6% rise, Romania (+ 13.2%), UK (+ 12.6%) and Poland (+ 11.1%). On the other hand, there were also countries which saw a decline in the value of their agricultural production, such as Slovenia (-4.7%) and Malta (-3.1%), while the situation in Croatia and Slovakia remained unchanged.

As far as Romania is concerned, there were increases in all the sectors, especially in the vegetal one. The year 2017 brought a rise in the output of plant breeding farmers by 17.9% compared to 2016, while the zootechnical services went up by 5.1% and the production of zootechnical farms saw a rise of 8.8%. Nevertheless, the data published by Eurostat, indicate that there was a 7.2% decrease in secondary non-agricultural services (for example in agro-tourism). The first nine months of the year 2018 proved to be favourable for the Romanian agriculture, with excellent cereal crops.

MATERIALS AND METHODS

The proposed analysis will use the data published by Eurostat regarding the economic accounts for agriculture.

Table 1. Economic accounts for agriculture (ITM_NEWA - cereals including seeds, INDIC_AG - production value at basic price)- current values (Million Euro)

Country	2015	2016	2017
Germany	7,127.90	5,653.63	6.322.02
Spain	3,607.41	3,823.77	2,983.64
France	11,253.30	7,737.63	9,675.89
Italy	4,233.03	3,995.17	3,472.45
Netherlands	339.40	266.55	285.49
Poland	3,545.09	3,530.89	3,955.24
Romania	3,316.34	3,448.48	4,203.15
UK	4,092.24	2,941.78	3,676.76

Source: https://ec.europa.eu/eurostat/web/agriculture/data/database, [2]

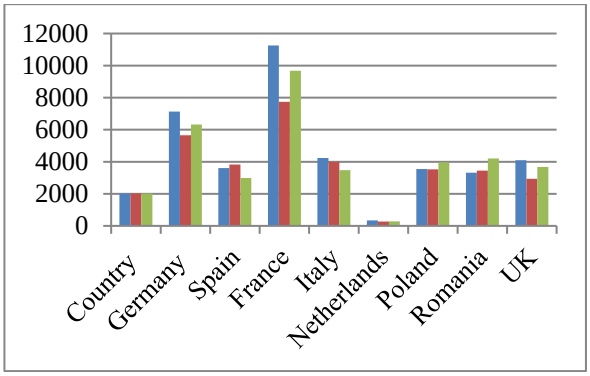

Fig. 1. Evolution of economic accounts for agriculture (ITM_NEWA - cereals including seeds, INDIC_AG - production value at basic price) , (Million Euro), Source: Eurostat, https://ec.europa.eu/eurostat/web/agriculture/data/database [2].

The mathematical algorithm used is structured as follows [3]:

In order to estimate dimensions we will be using confidence intervals. In most cases, an isolated (punctual) value can only be satisfactory if we refer to the variation domain and to the probability corresponding to it. Considering the fact that the sample estimators are random variables, one of the most important issues that arises consists in expressing the estimate accuracy or the estimate probability. However, the value of the P probability covers a certain interval (x_1, x_2) according to the relation:

$$P = Prob(x_1 < X < x_2) = \int_{x_1}^{x_2} f(x)dx \qquad (1)$$

to which the respective parameter belongs. In this way, a certain interval is established, called a confidence interval, has the property of containing the true value of the respective dimension with the P probability. Let a_0 be the true value of a characteristic for which a punctual estimate $\hat{a}$ is obtained through sampling experiments. We consider that the deviation $|\hat{a} - a_0|$ is lower than a ε value with a very high β probability (0.90, 0.95 or 0.99):

$$P(|\hat{a} - a_0| < \varepsilon) = \beta \quad (2)$$

or

$$P(\hat{a} - \varepsilon < a_0 < \hat{a} - \varepsilon) = \beta = 1 - \alpha \quad (3)$$

The punctual value $\hat{a}$ is calculated based on a sample and it defines the limits of the confidence interval: $a_1 = \hat{a} - \varepsilon$ and $a_2 = \hat{a} + \varepsilon$. Considering the risks for the lower part α_i and the upper part α_s to be unequal, the interval limits are defined by the relations $P(a_0 > a_2) = \alpha_s$ and $P(a_0 > a_1) = \alpha_i$, with the significance level $\alpha = \alpha_i + \alpha_s$.

In order to analyse the confidence interval for the values presented above in Table 1, the confidence interval will be analysed for the theoretical mean μ of a characteristic with normal distribution, where the dispersion σ is known.

The necessary stages are the following:

(a)We take a population to be analysed with an X characteristic having a normal distribution $N(\mu, \sigma^2)$.

(b)A volume sample *n* is extracted from this population. Let us estimate the μ mean with a 95% confidence interval with symmetrical bilateral risk. The significance level is α=0.05.

(c)We know that the sample mean $\bar{x}$ has a normal distribution $N(\mu, \sigma^2/n)$.

(d)Since the μ parameter is unknown, a confidence interval will be built for this dimension, its (-*z*, *z*) limits being established with the help of the Laplace distribution.

We know that the random variable:

$$z = \frac{\mu - \bar{x}}{\sigma / \sqrt{n}} \quad (4)$$

has a normal distribution *N* (0,1).

(e)According to the distribution table, the 95% probability is defined as the (1.96; +1.96) interval.

In this way we obtain the confidence interval with the P probability $P(-1.96 < z < 1.96) = 0.95$

Starting from this relation, we can write the double inequality:

$$-1.96 < \frac{\mu - \bar{x}}{\sigma / \sqrt{n}} < 1.96 \quad (5)$$

which leads us to the interval limits:

$$\bar{x} - 1.96\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + 1.96\frac{\sigma}{\sqrt{n}} \quad (6)$$

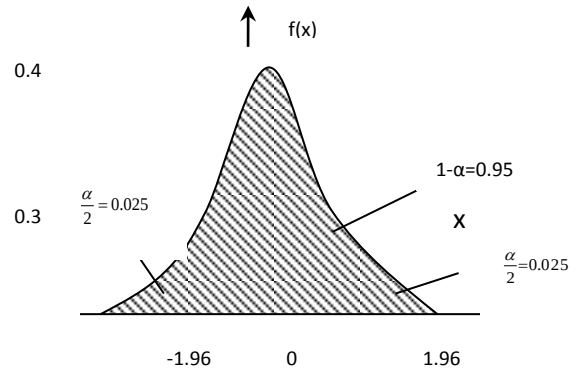

Fig. 1. Confidence interval with symmetrical bilateral risk interval having the significance level α=0.05.
Source: Ifrim, A. M., 2016, Mathematical tools in quality engineering – Application in project management, Lap Lambert Publishing, Saarbrücken, Germany.

(f) The 95% confidence interval has thus been built for μ. The result can also be expressed as:

$$\mu = \bar{x} \pm 1.96\frac{\sigma}{\sqrt{n}} \quad (7)$$

the interval being symmetrical in relation to the $\bar{x}$ value.

RESULTS AND DISCUSSIONS

It is common knowledge that almost half of the land in the EU is used for agriculture. Consequently, agriculture is indeed very important for the environment. Throughout

the centuries, it has contributed to the creation and preservation of a variety of valuable semi-natural habitats. Nowadays, they are shaping the diversity of the landscapes in the EU and are sheltering a rich and varied wild flora and fauna. [4]

An analysis of how the agricultural production evolved in the selected countries should take into account all the factors that can have an impact on the final results. [1].

The evolution of the agricultural production in the Member States in the past three years can provide the necessary data for estimating its evolution in the years to come.

In order to apply the previously described methodology, the main indicators must be calculated.

The next table presents the results of the mean and of the dispersion corresponding to the values of the agricultural production in the eight countries.

Table 2. Mean and dispersion values of agricultural production

Country	$\bar{x}$	σ
Germany	6,367.9	4,562.861
Spain	3,471.6	2,493.2535
France	9,555.6	6,982.5242
Italy	3,900.2	2,785.18
Netherlands	297.15	213.48714
Poland	3,677.1	2,611.229
Romania	3,656.0	2,629.0749
UK	3,570.3	2,590.9023

Source: Own determination.

One can observe that there has been a steady growth.

What we are trying to find out next are the intervals between which the respective countries should increase their agricultural production so that they maintain their growth and continue to exert the same influence on the economy as a whole.

Using the previously indicated values, we can calculate the 95% confidence interval for μ.

The result is presented in the following Table 3.

The analysis shows the confidence intervals for the evolution of agriculture in the presented countries, so that this evolution should continue to be positive and capable of influencing the GDP of the analysed countries.

Table 3. Confidence intervals

Country	$\bar{x}-1{,}96\frac{\sigma}{\sqrt{n}}<\mu<\bar{x}+1{,}96\frac{\sigma}{\sqrt{n}}$
Germany	2,716.80 $<\mu<$ 10,018.9
Spain	1,476.59$<\mu<$5,466.625
France	3,968.42$<\mu<$15,142.79
Italy	1,671.61$<\mu<$6,128.825
Netherlands	126.32$<\mu<$467.972
Poland	1,587.66$<\mu<$5,766.492
Romania	1,552.29$<\mu<$5,759.688
UK	1,497.11$<\mu<$5,643.414

Source: Own determination.

The evolution of the GDP should reflect the evolution of the value of the agricultural production. Thus, the GDP had the evolution as presented in Table 4.

Table 4. Evolution of GDP (Million Euro)

Country / Year	2015	2016	2017
Germany	2,745,337.0	2,847,740.0	2,954,696.0
Spain	980,992.0	1,014,839.0	1,057,467.0
France	1,967,466.0	1,991,276.0	2,042,082.0
Italy	1,485,251.4	1,517,530.6	1,546,693.5
Netherlands	620,835.0	634,824.0	660,393.0
Poland	381,730.8	376,783.3	410,255.8
Romania	140,928.1	152,853.4	169,732.4
United Kingdom	2,331,146.0	2,142,877.2	2,080,119.1

Source: Eurostat, https://ec.europa.eu/eurostat/web/agriculture/data/database, [2].

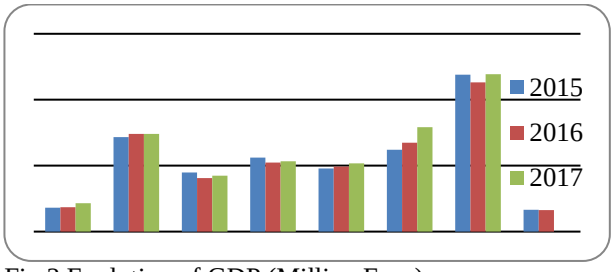

Fig.2.Evolution of GDP (Million Euro)
Source: https://ec.europa.eu/eurostat/web/agriculture/data/database, [2].

By applying the previously presented algorithm in order to establish the confidence intervals which correspond to the proportion of agriculture in the GDP, we have obtained the results showcased in Table 6.

Table 5. Percentage of agriculture in the GDP

Country / Year	2015	2016	2017
Germany	0.72	0.74	0.86
Spain	2.87	2.97	2.96
France	1.79	1.62	1.69
Italy	2.25	2.10	2.13
Netherlands	1.92	1.97	2.07
Poland	2.48	2.70	3.17
Romania	4.76	4.53	4.77
United Kingdom	0.66	0.65	0

Source: https://ec.europa.eu/eurostat/web/agriculture/data/database, [2].

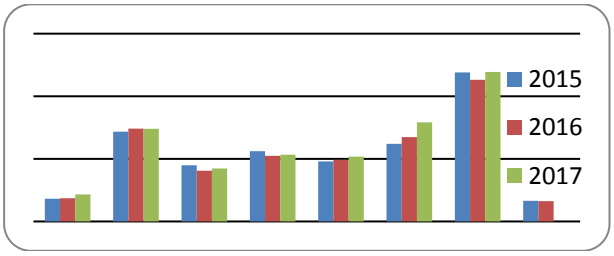

Fig.3. Evolution of the percentage of agriculture in the GDP
Source: https://ec.europa.eu/eurostat/web/agriculture/data/database, [2].

Table 6. Confidence intervals corresponding to the percentage of agriculture in the GDP

Country	$\bar{x}$	σ	$\bar{x}-1{,}96\frac{\sigma}{\sqrt{n}}<\mu<\bar{x}+1{,}96\frac{\sigma}{\sqrt{n}}$
Germany	0.77	0.45	$0.33<\mu<1.22$
Spain	2.93	1.69	$1.27<\mu<4.59$
France	1.70	0.98	$0.74<\mu<2.66$
Italy	2.16	1.25	$0.94<\mu<3.38$
Netherlands	1.99	1.15	$0.86<\mu<3.11$
Poland	2.78	1.63	$1.18<\mu<4.38$
Romania	4.69	2.71	$2.03<\mu<7.34$
UK	0.44	0.40	$0.05<\mu<0.83$

Source: Own determination.

Thus, one can notice the confidence intervals corresponding to the percentage of agriculture in the GDP so that agriculture should have the same impact on the GDP.
Agriculture and the food industry are essential elements of the current economy and society. In all the 28 Member States there are approximately 12 million agricultural workers, while another 4 million people are employed in the food sector. Together, the agricultural and food sectors make up 7% of the total work places and generate significant values in the GDP of the EU countries.

CONCLUSIONS

During the last decades there have been considerable changes in the EU agricultural policy meant to help the farmers cope with these challenges and react promptly to the changing attitudes and expectations of the population.
The EU institutions cooperate in order to guarantee optimal food and agricultural policies at all stages: planning, implementation, monitoring and evaluation. The national and local authorities introduce the legislation agreed upon at EU level. Through the EU budget, the funds are made available to the Member States in agreement with the norms established in the EU. Likewise, the EU monitors the way in which the legislation is enforced, as well as its effectiveness, while coordinating the amendments at the same time.
Within this context it is necessary to make a forecast of the evolution of the values of agricultural production because this implicitly allows one to analyse if the EU agricultural policy is correctly implemented.
This paper concludes that the fluctuations of the agricultural production are still triggering variations of the GDP, although the percentage of agriculture in the GDP is situated within the same range of values. This means that the agriculture is maintaining its impact on the GDP.

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DEVELOPMENT OF AGRICULTURAL PENSIONS IN ROMANIA

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Abstract

The complex nature of agrotourism as an economic phenomenon has a major impact on the social cultural development of Romania in all the geographical areas in which it manifests itself. The study of agrotourism development begins by identifying the geographic space in which it occurs. Agrotourism is known to spread along the borders of some counties and localities that are concentrated in the Carpathian Areas, in the Colinar Depression area of Transylvania, to which are added the Danube Delta, Mehedinti Plateau and Suceava Plateau.
Due to its development, agritourism has become an important means of tourism attraction, being represented by a wide range of specific attributes. The main types of ethno-folkloric villages considered to be representative of rural areas in Romania have led to the expansion of agrotourism practice due to a set of essential attributes related to house architecture, folk port, music and specific choreography. All these require the provision of tourist-specific services, equipment and an appropriate decoration along with the serving of traditional gourmet menus. As a research method, we chose the creation of a studio based on the statute data published by INSSE regarding the dynamics of the agro-tourism pensions at the national level for the last 5 years. The main indicators analyzed relate to: Existing tourism accommodation capacity, tourist accommodation capacity in operation, arrivals, overnight stays and net use index of tourist accommodation capacity in operation.

Key words**:** *accommodation, arrivals, overnight stays, Romania*

INTRODUCTION

Agrotourism in Romania, is experiencing a development that is closely related to the practice of rural tourism being geographically different. Thus, the main regions, counties and localities involved in the development of rural tourism are situated in the Carpathian and Sub-Carpathian Areas, in the Colinar Depression of Transylvania, in the Danube Delta, but also in the Mehedinţi and Suceava Plateau, being less developed in the area plain [1, 3].

This concentration has been made in close connection with the existence of traditional villages which in turn are classified in the literature as being of several types [2].

Of these, there are ethnographic and folklore villages that include a number of localities where the traditional folk port, house architecture, interior decoration, music and choreography prevailed unchanged for centuries [2, 4].

In the ensemble that it forms all this offers tourists accommodation and authentic mass. Within these villages there are exhibitions organized as open-air museums, not even the life of the village of the seventh day celebrated through the game of traditional horseradish [1, 5].

Another type of tourist village known in the national space is the one dedicated to the artistic and craftsmanship known for being interested in foreign tourists to develop the horizon of their knowledge and the desire to acquire a series of handicraft artworks directly from manufacturers [10].

Over time they have gained a great importance for the development of the tourist phenomenon in the rural area and the landscape-climatic villages [7].

Being preferred for the peace they offer in relaxation and solitude, the natural setting they have is the desirable point in choosing such a leisure destination.

Situated in hilly or mountainous areas, houses having houses spread over valleys and hills, separated from meadows, meadows or orchards, can satisfy the fundamental

motivation of many Romanian or foreign tourists through the message of "the return to nature". In this case the Şirnea, Fundata, Bran and Moeciu localities are well known [6, 7].
Due to a growing number of fishing practitioners and sports hunters, a number of agropotasies have been developed in rural settlements that provide them with gastronomic culinary services that are packed with the organization of specific hunting sessions or local fishing. The best known examples in this case are the villages located on the Viseu and Bistrita valleys, in the Gurghiu area and in the Danube Delta [4].
Regarding the location of the localities where fruit trees and vines are grown, a number of locations have been developed in Romania, where specific tourism activities predominate throughout the year, both during fruit harvesting and afterwards, by offering for their consumption, but also by organizing conservation and preparation activities. Well-known villages in this case are located in the areas of Recaş, Agapia and Vânători-Neamţ [6, 11].
The typology of the Romanian villages also includes pastoral villages located in the mountains, where the main activity of the locals is the sheep and cattle breeding.
This type of village attracts tourists through a menu based on complex dairy products to which other egg, poultry, sheep and cattle can be added and for shepherd's entertainment are organized shepherd's feasts [13].
The list of typologies is comprised of tourist villages where various sports can be practiced, ranging from winter to nautical rides on the inner rivers, on reservoir lakes, without the need for expensive special arrangements.
In conclusion, the transformation of rural areas into agritouristic destinations of excellence is possible through the realization of investments designed to develop and promote local business to create a constant demand for tourism activities by capitalizing on the full potential of existing land [10, 12].
Research on the agro-tourism phenomenon highlights the fact that it has a major impact on the development of society from all points of view, economic, social and cultural [9].

MATERIALS AND METHODS

The purpose of this research is to identify the current state of development of the agro-tourism phenomenon at national level.
For this purpose, the research was used on the basis of an analysis of data obtained in the economic context, using secondary information information to further create a basis for the implementation of field research.
The information obtained in this way allows understanding the phenomena studied.
The aim of the research is to identify, extract and evaluate a number of indicators specific to agri-tourism activity at national level.
The collection of secondary information on the material technical basis of agrotourism in Romania implies a documentary activity based on the collection of reliable, objective and valid data from trustworthy sources, which is why original statistical sources provided by INSSE were used [8].
In this case, the information carriers were not visibly trained in the research, eliminating the behavioral distortions that are frequently encountered in the data collection situation in a different way.

RESULTS AND DISCUSSIONS

Thanks to the Agricultural and Rural Development Policy in Romania, the main objective is to stimulate the transformation of peasant farms into family agro-farmhouses that have a commercial character to form the middle class of the society in rural areas.
This objective entails the efficient allocation of budgetary resources to support agricultural producers and, implicitly, to support the development by modernizing the villages.
Looking at the development of agro-tourist pensions in Romania as a whole, we observe according to INSSE that they start their evolution since 1996 (Table 1).
In the first mention of the appearance of agro-touristic pensions in national statistics, six such locations are identified from a total of 2,965 units, which represents 0.20% of the entire national accommodation base.

Table 1. The evolution of Agro-tourist boarding houses from 5 to 5 years

The Year	2016	2011	2006	2001	1996
Agro-tourist boarding houses	2,028	1,210	1,259	536	6
Number of establishments	6,946	5,003	4,710	3,266	2,965
Percent	**29.19**	**24.18**	**26.73**	**16.41**	**0.20**

Source: Own calculation.

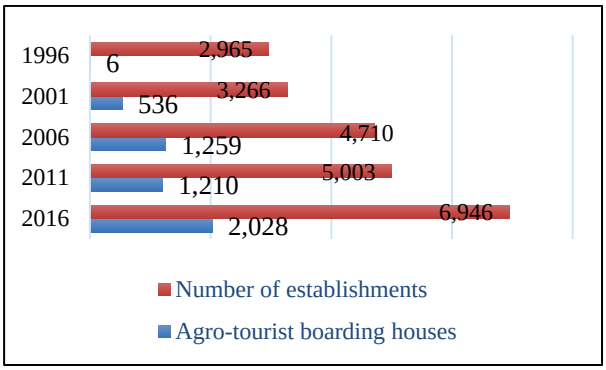

Fig.1 The evolution of Agro-tourist boarding houses
Source: Own determination.

For 5 years, the number of agrotourist pensions in Romania increased to five hundred thirty-six units registered according to statistical data in year 2001, which represents 16.41% of the national accommodation base, a significant increase of 16.21% compared to the reference year.
Analyzing the statistical data after another period of five calendar years, it is noted that their number increased by two times. In year 2006, a total of one thousand two hundred and fifty-nine units were registered in the base of INSSE, which represents 26.73% of the total national tourist reception facilities.
We observe for the year 2011 a decrease in the number of agrotourist pensions compared to their number in the year 2006 as 24.18% of the total accommodation structures in Romania. In the following period their number increases by 29.19%. In conclusion, the preference of tourists for practicing agritourism in Romania can be observed in the dynamics of the development of the specific base of agrotouristic boarding houses from year to year. Regarding the material technical basis of the reception facilities in Romania in the year 2018, there is an increase of 1.6% according to the national statistical data. From this base, the largest share is held by the Hotels category with 58.5%. These are followed by 13.2% agrotourism boarding houses and 11.8% tourists' pensions.
The evolution of the existing tourist accommodation capacity for the agrotourist pensions between years 2017 - 2013 is presented in Table 2.
The indicator of accommodation capacity is the number of accommodation used for tourist purposes in operation, which is entered in the documents of reception, approval, classification of agrotourist pensions, except the additional beds being determined for those existing on 31 December.

Table 2. Accomodation capacity 2013 - 2017

The Year	2017	2016	2015	2014	2013
Agro-tourist boarding houses	2,556	2,028	1,918	1,665	1,598
Total	7,905	6,946	6,821	6,130	6,009
Procent	32.33	29.19	28.11	27.16	26.59

Source: Own calculation.

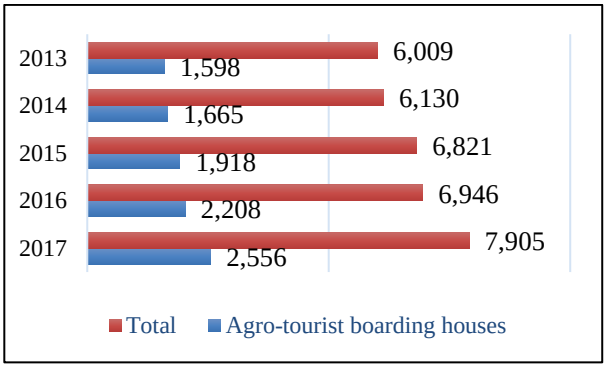

Fig.2 The accommodation capacity
Source: Own determination.

From the statistical analysis of the data we can observe the tendency of increasing the accommodation capacity in the segment of the agro-touristic pensions from 26.59% in the year 2013 to a 32.33% in the year 2017. The percentage increase is 0.57% for the year 2014 compared to the year 2013 and 0.95% in the year 2015 as compared to the year 2014. The rate of growth of 1.08% is recorded in the year 2006 as compared to year 2005, the rate rising to 3.14% for the year 2017 compared to the previous one. The percentage increase is determined by the development of the accommodation base and the diversification of domestic tourism services. In the following

we will present the analysis of the agrotourism accommodation capacity indicator according to the geographical location in which it is located. The specific indicator is obtained by multiplying the number of seats by the number of days. These do not include places in agro-touristic shelters temporarily closed due to lack of tourists or for repairs.

Table 3.Capacity of tourism accommodation in function, on tourist areas (places – days) 2018

Total	Spa resorts	Seaside	Mountain area	The Danube Delta	Bucharest and others The cities Reunion of County	Other Localities
11,569,412	318,689	16,463	4,597,650	283,587	138,643	6,214,380
%	2.75	0.14	39.73	2.45	1.19	53.71

Source: Own calculation.

According to the statistical data processing at the national level, in the year 2018 the territorial distribution of the agro-touristic pensions in Romania shows a high concentration of them in the mountain area in a number of four million five hundred ninety-seven thousand six hundred fifty units. The second place is located in the spa resorts with Three hundred eighteen thousand six hundred eighty nine units, followed by the location of the Danube Delta with Two hundred eighty three thousand five hundred eighty seven units. The following places are occupied by the Bucharest area and the other bigger cities of the country, with One hundred thirty eight thousand six hundred forty three units and the Black Sea coastal space with Sixteen thousand four hundred sixty three units. According to the data analyzed, there are a number of Sixteen thousand four hundred sixty three units located in other geographic areas than those identified.

An important economic indicator is the Tourist accommodation capacity in function, in tourist areas (places - days) shown in Table 4 following the nationality of the tourists.

The analysis of the specific data in Table 4 shows that the entire tourist accommodation capacity by tourist areas (places - days) is increasing during the period between years 2014 -2017 and decreases slightly in the year 2018.

Table 4. Capacity of tourism accommodation in function, on tourist areas (places - days)

The Year	Total on tourist areas (places - days)
2018	11,569,412
2017	11,787,897
2016	10,336,702
2015	9,079,901
2014	8,219,971

Source: Own calculation.

The analysis of the arrival indicator of tourists in the agro-touristic pensions in Romania, according to their nationalization, is shown in Table 5.

Tourists' arrivals occur when a person enters the register of the boarding house to be hosted one or more nights without interruption. In each agrotouristic boarding house, a single arrival per tourist is counted regardless of the number of overnights. The family is registered according to the number of arrivals per member for which at least one place has been paid.

Table 5. The number of tourists arriving in Agro-tourist boarding houses

	2018	2017	2016	2015	2014
Romanians	1,026,507	917,213	748,320	622,187	192,013
Foreigners	81,447	87,187	65,134	50,569	9,764
Total	**1,107,954**	**1,004,400**	**813,454**	**672,756**	**201,777**

Source: Own calculation.

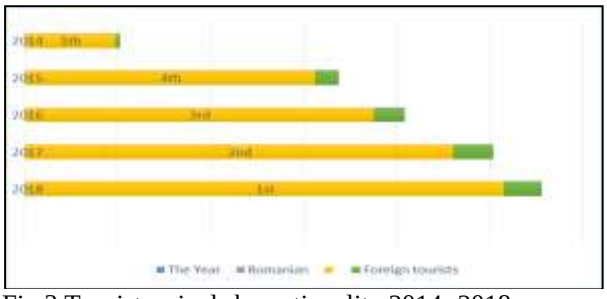

Fig.3 Tourist arrivals by nationality 2014- 2018
Source: Own determination.

The analysis of the data on the evolution of the arrivals indicator shows the tendency of its increase due to the large evolution of the number of persons accommodated in the agro-touristic pensions in Romania in the year 2018. Both Romanian tourists and foreign tourists register an increase in the number of arrivals from year to year. This is due to the increase in the quality of the services offered by the tenderers and to the promotion of national traditional values internally and internationally.

The overnight stays of the Romanian and foreign tourists in the agrotourist pensions in Romania are shown in Table 6.

Overnight stays within 24 hours of registering a person in the agritouristic boardinghouse, which benefits from hosting for a cost, even if the actual length of stay is less than 24 hours. This indicator also includes overnights for additional beds paid by tourists on request.

Table 6. Overnight in Agro-tourist boarding houses

	2018	2017	2016	2015	2014
Romanians	1,949,740	1,750,354	1,457,163	1,256,092	990,179
Foreigners	166,893	17,813	140,776	112,900	91,342
Total	**2,116,633**	**1,928,485**	**1,597,939**	**1,368,992**	**1,081,521**

Source: Own calculation.

After analyzing the statistical data referring to the tourist overnight stays in the Romanian agro-touristic hostels, the year-on-year growth trend is noticeable both for the segment of foreign tourists and for Romanian tourists.

This increase is due to the increase of tourist circulation at national level and the development of the specific technical material base with the diversification of the services provided to the clients, the creation of a national and international reputation supported by the practice of the local traditions and customs.

Table 7 analyzes the index of the net capacity index. This is the expression of the relationship between the effective use by tourists of accommodation capacity in operation and its actual use by the tourists, being determined by the calculation of the total number of overnight stays, the tourist accommodation capacity in operation agro-touristic pensions of that period.

Table 7. Indices of net use of accommodation capacity

The Year	2018	2017	2016	2015	2014
Total Agro-tourist boarding houses	18.3	16.4	15.5	15.1	13.2

Source: Own calculation.

As can be seen, the net index values show a year-on-year increase in the actual use of accommodation in operation throughout the analyzed period, starting from 13.2 for the year 2014 to 15.1 for the year 2015 in this case the increase being 2.1%. It is noticed that between 2015 and 2016 there is a preservation of its value, registering a small increase of only 0.4% in the year 2016 compared to the year 2015. For the years 2017 and the year 2018 there are registered annual increases against the values of the years 2015 and 2016 by 0.9% in the year 2017 compared to the year 2016 and by 1.8% in the year 2018 compared to year 2017.

The positive evolution is the result of the increase in the tourist traffic and the number of arrivals of the tourists staying in the agrotourist pensions in Romania. These increases are due to the development of the specific technical material base and the promotion of ancient values along with the diversification of tourism services as a whole.

CONCLUSIONS

With the evolution of technology by increasing leisure time and revenue on an

ultra-technologized continent, Romania welcomes its tourists to archaic villages where faith and traditions are preserved from father to son of generations. If in the Western world the countryside is just a reminder, the tourist visiting Romania now has an alternative to discover ancient places where pastors still climb their flocks to the mountains, places where the campfire still lights around villages and not in the last places where I can attend the milking of the sheep, preparing the cheeses listening to the laughter in the peasant courtyards in the silence of the evening. In the long winter nights in our villages we still have carpets at war and the tourist in this emotional load can be an active participant in the gathering of the vineyards or in the eggs, the cooking of the dishes or the cutting of the wood for fire. All these activities that result in a life experience have led to the emergence and development of the technical base of the accommodation materials year by year increasing the number of agritourism lodges placed in the middle of nature in a picturesque landscape, endowed with the comfort of a modern world.

As a result of our analysis, we have seen an increase in specific tourism indicators that contribute to raising living standards by increasing profit and developing the national economy. The continuous development of agrotourism at the national level is a priority of the domestic policy. Therefore, the actions of supporting the small entrepreneurs are carried out on a permanent basis both nationally and internationally, with the possibility of accessing foreign financing funds. Keeping alive the traditions and culture of a people is, besides an emblematic visit card itself immortality.

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INSTITUTIONAL RATIONALIZATION OF MANAGEMENT FOR STABLE PROGRESS OF RURAL AREAS

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Abstract

This article focuses on sustainable rural development through improved institutional management. The question of handling the socio-economic boost of agrarian areas in Russia has pronounced regional specifics, which provides for the optimal combination of creating new state institutions and institutional reforms. The study proposes to improve the structure and functions of managing rural development at various levels: regional, municipal and township. At each of them, a new structural management body is introduced, or a civil servant chargeable for substantial agricultural progress, with more clearly defined functions and full coordination and responsibility. The combination of mandatory processes and individual functions of the institute for managing sustainable rural development will optimize decision making in this area of regions. This will help increase the efficiency of the institutions of sustainable rural development.

Key words**:** *rural areas, sustainable development, institutional management, management structure improvement, management level function optimization*

INTRODUCTION

Sustainable development of rural areas is largely dependent on the coordinated work and organization of effective institutions of government and the social sphere.

The current crisis in the institutional progress of agricultural areas of the country, both at the regional and local levels, suggests the need to combine a differentiated approach and institutional design not only in improving the organization of functioning of the territories, but also in optimizing the functions and structure of administration of agricultural development.

The definition of “the institute” was proposed by T. Veblen. It was the root of institutional theory, the founder of which was D. North [12]. Hereafter, essential share to this theory was made by E. Ostrom [15], who became the source of institutional design. Among domestic scientists an important role in the development and adaptation of institutionalism to the specific conditions of developing countries was played by the works of V. Polterovich [17], Sukharev O.S. [19] and other authors.

The significance of institutions in the system of social relations should not be underestimated, since in fact they form the social infrastructure of our behavior 0, 0.

According to E. Ostrom, there is no universal institutional panacea for any type of community. Local governments should work more efficiently, relying on the specifics of regions and / or municipalities, than federal agencies. This appropriate authorities can reflect more rapidly and adaptable to shifts in the economic and social sphere of the area where they are located and therefore have a higher degree of trust within the community. In this regard, as E. Ostrom states, the ideal institution is the construction, which equally combines the complex of informal and formal rules, in the creation of which both members of this society and external reformers take part 0.

Each country has its own specific institutions, which change in the process of institutional development and reform, along with the institutional environment, customs and laws. It happens that institutional changes lag

behind in time, and this hinders the development of reforms in society. At once, new institutional forms [13], created at the highest level by simple borrowing or imitation of more successful states and societies, often cause negative consequences. Society does not always perceive the emergence of new institutions that are not adapted to local realities, as a result of which they either become ineffective or do not work at all.

To solve this problem for the post-Soviet Russia, V.M. Polterovich, based on the scientific works of C. Johnson [5], proposes to introduce institutions of catching up development, the purpose of which is to soften the process of social adaptation and ensure rapid economic growth in the conditions of cultural, institutional and technological constraints [16].

MATERIALS AND METHODS

In accordance with the foregoing, the article aims to develop a method for persistent evolvement of rural areas, providing for the optimal combination of creating new government institutions in agricultural regions and optimizing the structure and functions of managing rural development.

The conceptual basis of the research is the organic synthesis of works by well-known world and Russian scientists on the theory of institutions, administrative potency and persistent evolvement of agricultural areas [1, 9, 10, 12, 15, 16], as well as modern legal acts and programs of federal and regional importance. When analyzing the current state of the agricultural territories in the Russian Federation and the Saratov region we match the outputs of administrative potency ratings in the different regions of RF for 2017 APEK (Agency for Political and Economic Communications) in conjunction with the Laboratory for Regional Political Studies of the National Research University Higher School of Economics 0 and the rating of the socio-economic status of the constituent entities of the Russian Federation for 2017 from the RIA Rating of the Russia Today media group 0.

Based on a study by L.V. Bondarenko [1] and others, when studying the typology of agricultural areas for the purpose to systematize indicators of administerial potency of agricultural development in regions, we adjust comparative static and dynamic methodological approaches basing on monitoring results of the Ministry of Agriculture of Russia together with the All-Russian Institute of Agrarian Problems and Informatics named after A.A. Nikonov 0.

To improve the driving of agricultural development we used elements of institutional design theory, catch-up development of institutions and the management agricultural areas persistent development theory were applied through a combination of policy and subsidiary approaches.

Main methods of the research are: statistical-economic, monographic, abstract-logical, and calculation-constructive. Results of the research rely on the identification of the current condition, issues and tendencies in the development of the institute of management of rural areas at the regional level. The article conclude and classify main theories of the generation of government institutions at different management levels of agricultural areas development. It includes the optimization of the structural and functional cooperation of their participants.

RESULTS AND DISCUSSIONS

In all economically developed countries, close attention is paid to the rural areas by the state, in connection with which their sustainable development is becoming increasingly important. Rural areas occupy most of the territory of Russia. The well-being of the country is largely reliant on their level of development. The present socio-economic condition of the agricultural territories of the Russian Federation is characterized by the unsettled life of a significant part of the settlements, the poor state of the social infrastructure, the outflow of the economically active population to the cities and the unwillingness of investors to invest in rural development. Main reason of these problems is using unitary policy at the federal level in the sphere of rural areas management

that ignore regional specific in the spatial distribution of the rural population and agricultural economy. This immoderate centralization of local management does not lead to enhancing of the socio-economic condition. It makes necessary to engage institutional changes.

The strategic development of the country's territories, enshrined in legislative acts, provides for a set of priority measures for each type of region, different in the nature and conditions of rural development [23], but the implementation of this approach and the establishment of differences in agricultural development at the level of separable region have a lack of elaboration.

According to statistics from 2007 to 2017, the number of rural settlements in Russia decreased by 1,815 units or by 19% and as of 01.01.2017 amounted to 18,104 (Table 1). Based on the analysis of domestic and foreign experience, it can be argued that these processes have a negative impact on the socio-economic condition of agricultural territories 0.

Table 1. The main indicators of socio-economic condition of rural areas Russian Federation

Indicators	2012	2013	2014	2015	2016	2017	2017 to 2012, %
The number of rural settlements, units	18,831	18,726	18,537	18,485	18,205	18,104	96.1
The number of population in rural areas, mln people	34.4	33.9	34.0	33.7	34.0	33.7	98.1
The number of population with money incomes below the subsistence minimum , mln people	6.9	6.2	6.4	6.3	7.2	7.6	110.1
The rural labor force aged 15-72, thousand people	18,345	18,100	18,081	17,893	18,133	18,089	98.6

Source: Compiled by the authors on the basis of data [14].

The number of rural population in Russia at the beginning of 2017 amounted to 37,772 thousand people. For 2016, it decreased by 115.3 thousand, continuing the negative trend of previous years. The dynamics of the rural population is multidirectional in various federal districts. If throughout the Russian Federation, the rural population decreased by 3% by 2017, then in the Volga Federal District - by 6.9%, in the Far Eastern Region - by 6.2% and in the Ural Region - by 5.2%. In the Southern Federal District, the rural population declined slightly - by 0.2%. The only region where the rural population grew was the North Caucasus region - an increase here was 5.3%. In the Saratov region, the total rural population for 2013–2016 decreased to 607.1 thousand people (by 3.8%) 0.

In terms of employment in rural areas, the most able-bodied groups (40–49 and 30–39 years) lead, while the lowest employment rates are observed among young people (15–19 years old) and retirees. The number of labor power in the village at the age of 15–72 years for the period of 2011–2016 decreased by 256 thousand people, or by 1.4%. At the same time, there was a situation when the population with cash income below the subsistence minimum in Russia as a whole increased by 700 thousand people, including in rural areas - by 400 thousand people and amounted to 7.6 million people at the beginning of 2017 [14, 24].

The problems of rural residents are mainly related to the living conditions and the scope of medical care (Table 2).

Table 2. The main indicators of social infrastructure of rural areas Russian Federation

Indicators	2012	2013	2014	2015	2016	2017	2017 to 2012, %
The number of: -hospitals, units	1,295	1,216	1,095	1,050	1,036	1,006	77.7
- ambulance stations, units	1,101	1,053	1,046	1,009	965	946	85.9
- obstetric points, thousand	35.0	34.8	34.7	34.4	34.2	34.0	97.1
- preschool institute, thousand	19.3	19.2	19.1	18.3	17.6	17.0	88.1
- schools, thousand	32.8	31.9	31.1	30.3	29.8	29.2	89.0
- cultural institute, thousand	39.7	38.5	37.2	36.4	35.4	36.3	91.4
- libraries, thousand	33.2	31.1	30.3	30.1	30	29.6	89.2

Source: Compiled by the authors on the basis of data [14].

For the years 2012-2017 in rural areas, the number of hospitals decreased by 289

(22.3%), first-aid stations (FAS) by 1,001 (2.9%), and ambulance stations by 155 (14.1%). [14].

The condition of engineering infrastructure in rural areas remains satisfactory and covers about 60% of the population's needs (Table 3).

Table 3. The Main indicators of engineering infrastructure of rural areas Russian Federation

Indicators	2012	2013	2014	2015	2016	2017	2017/ 2012, %
The level of drinking water supply, %	57.3	59.1	60.1	61.1	62.7	64.1	111.9
The level of gasification of rural houses, %	54.2	55.8	55.8	57.8	58.2	58.7	108.3
The proportion of regional public roads that do not meet regulatory requirements, %	64	63.5	62.1	62.9	61.9	58.8	91.9

Source: Compiled by the authors on the basis of data [14].

There is no improvement in the technical condition of buildings of rural cultural and leisure centers. The numbers of libraries in agricultural territories, its funds and visitors have tendency to decline. 93.9 thousand rural settlements in the country remain not gasified. The condition of the street water supply network in rural areas remains unsatisfactory, for example, in 2016, 43% of the street water supply networks needed to be replaced. Provision of the rural population with drinking water at a level of more than 90% has developed only in 4 subjects of the Russian Federation [14].

Distinctive function of institutions in enhancement the sustainable evolution of agricultural territories is concerned by Russian scientists V.V. Lazovsky and V.P. Chajka [2, 7]. They represent the sustainable development of rural areas as a system whose elements are, among other things, structural transformations by creating new institutions aimed at meeting the needs of the local population.

In our study, when comparing rating assessments of management efficiency by regions of the Russian Federation (the political and managerial units of expert evaluation) and monitoring the socio-economic evolution of agricultural areas, the resulting diagram (Fig. 1) did not find out intercorrelation between the socio-economic development of areas and level of managerial efficiency. The RF regions with the identical managerial efficiency are located in different areas of socio-economic development, such as, for example, the Republic of Tyva, the Saratov and Tambov regions.

Accordingly, when assessing the effectiveness of managing the sustainable progress of areas, as a newly created institution, it is necessary to rely on the dynamics of quantitative measures of the socio-economic progress of the rural development.

Indeed, according to the definition of Sukharev O.S. the "market" criterion of the effectiveness of the activities of some institutions will not be relevant, since certain industries should not exist in market conditions (defense industry) 0. In our opinion, the social sphere and management of progress in agricultural areas can also be attach to such institutions.

We consider the enhancement of the institutional management by combining of directive and subsidiary approaches. According to the first, the control mechanism involves a set of events "lowered from above" that do not take into account the full information about the situation "on the ground". Subsidiary mechanism is carried out through the use of "signals from below" when The economic component of sustainable rural development is based on the ability of local authorities to raise additional funds and use them effectively [11, 25]. According to our research, this is especially important in modern conditions, when the majority of local budgets of regions are 80% or more subsidized. That is why institutions are of paramount importance in the in the progress of agricultural areas in RF regions 0.

In our research, a method of sustainable development of agricultural territories has been developed, focused on improving institutional management. At the federal level,

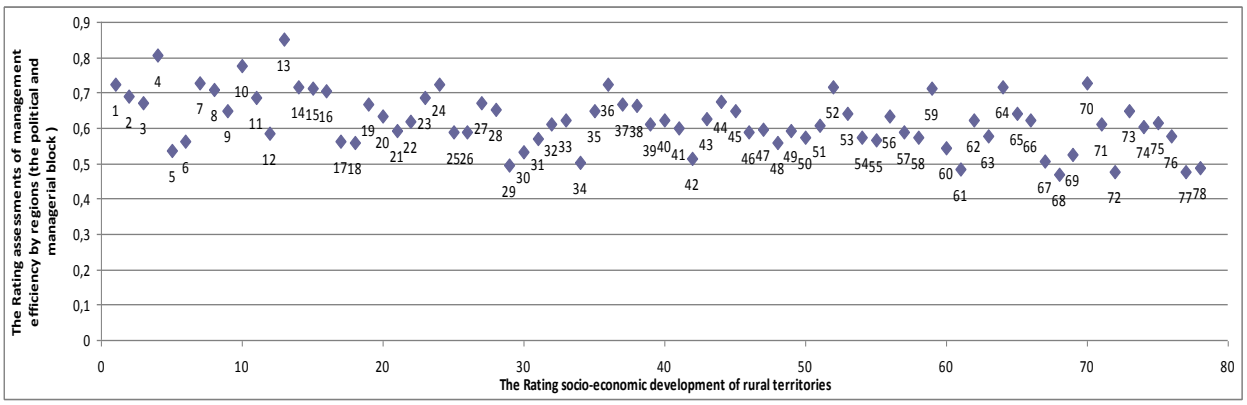
the country has adopted a number of legal acts that determine the functioning of the institute for managing sustainable rural development [20, 0, 0, 0. Rural development programs also exist at regional levels and, at the request of administrations, can be developed at local municipal and township levels, but in most cases this does not happen.

Russia has a four-level model for managing the development of rural territories: federal, regional, municipal and village.

According to the Federal Law No. 131, at a lower level of management of rural development, a greater number of responsibilities are concentrated in comparison with the possibilities of financing territories.

Many territories do not have sufficient socio-economic potential to create the necessary level of self-sufficiency in them. For such areas, state support of socially significant projects is needed in full. In the course of our research the reform of the structure and optimization the functions of managing the progress of agricultural territories are developed on the pattern of the Saratov region.

At the moment, the management of rural development in the region is far from perfect, there is no clear structure with the definition of the subjects of responsibility and specific functions at each level, as well as the conditions and order of coordination and control. In this connection, there is a duplication of functions and the cyclical nature of the costs of the management system.



SUBJECTS OF THE RUSSIAN FEDERATION									
1	Republic of Tatarstan	17	Stavropol Territory	33	Amur Region	49	Novgorod Region	65	Pskov Region
2	Leningrad Region	18	Kursk Region	34	Karachayevo-Circassian Republic	50	Omsk Region	66	Republic of Buryatia
3	Lipetsk Region	19	Moscow Region	35	Krasnoyarsk Territory	51	Republic of Mari El	67	Republic of Karelia
4	Belgorod Region	20	Penza Region	36	Republic of Ingushetia	52	Chukotka Autonomous Area	68	Arkhangelsk Region
5	Murmansk Region	21	Astrakhan Region	37	Rostov Region	53	Vologda Region	69	Republic of Altai
6	Republic of Adygea	22	Kaliningrad Region	38	Saratov Region	54	Komi Republic	70	Republic of Mordovia
7	Samara Region	23	Tambov Region	39	Primorye Territory	55	Republic of Sakha (Yakutia)	71	Chuvash Republic
8	Voronezh Region	24	Tula Region	40	Republic of Daghestan	56	Tver Region	72	Irkutsk Region
9	Kabardino-Balkarian Republic	25	Yaroslavl Region	41	Republic of Kalmykia	57	Altai Territory	73	Magadan Region
10	Kaluga Region	26	Tomsk Region	42	Ryazan Region	58	Smolensk Region	74	Ulyanovsk Region
11	Nizhny Novgorod Region	27	Bryansk Region	43	Sakhalin Region	59	Perm Territory	75	Republic of Tuva
12	Oryol Region	28	Chelyabinsk Region	44	Kamchatka Territory	60	Republic of Khakassia	76	Kurgan Region
13	Chechen Republic	29	Ivanovo Region	45	Orenburg Region	61	Novosibirsk Region	77	Trans-Baikal Territory
14	Krasnodar Territory	30	Volgograd Region	46	Sverdlovsk Region	62	Vladimir Region	78	Jewish Autonomous Region
15	Tyumen Region	31	Republic of North Ossetia-Alania	47	Udmurtian Republic	63	Kemerovo Region		
16	Republic of Bashkortostan	32	Khabarovsk Territory	48	Kirov Region	64	Kostroma Region		

Fig. 1. Distribution of subjects of Russia according to the rating of management efficiency and socio-economic development of rural areas for 2017

Source: Compiled by the authors based on Management efficiency rating in the Regions of the Russian Federation in 2017: economic communications (APEC) Laboratory for Regional Policy Studies, National Research University Higher School of Economics and On the state of rural areas in the Russian Federation in 2016: Annual monitoring report.

We propose to clearly distinguish between the subjects of impact and their functions on the stable progress of agricultural territories in the region for different levels, as well as to optimize the structure, coordination procedure, responsibility (Fig. 2).

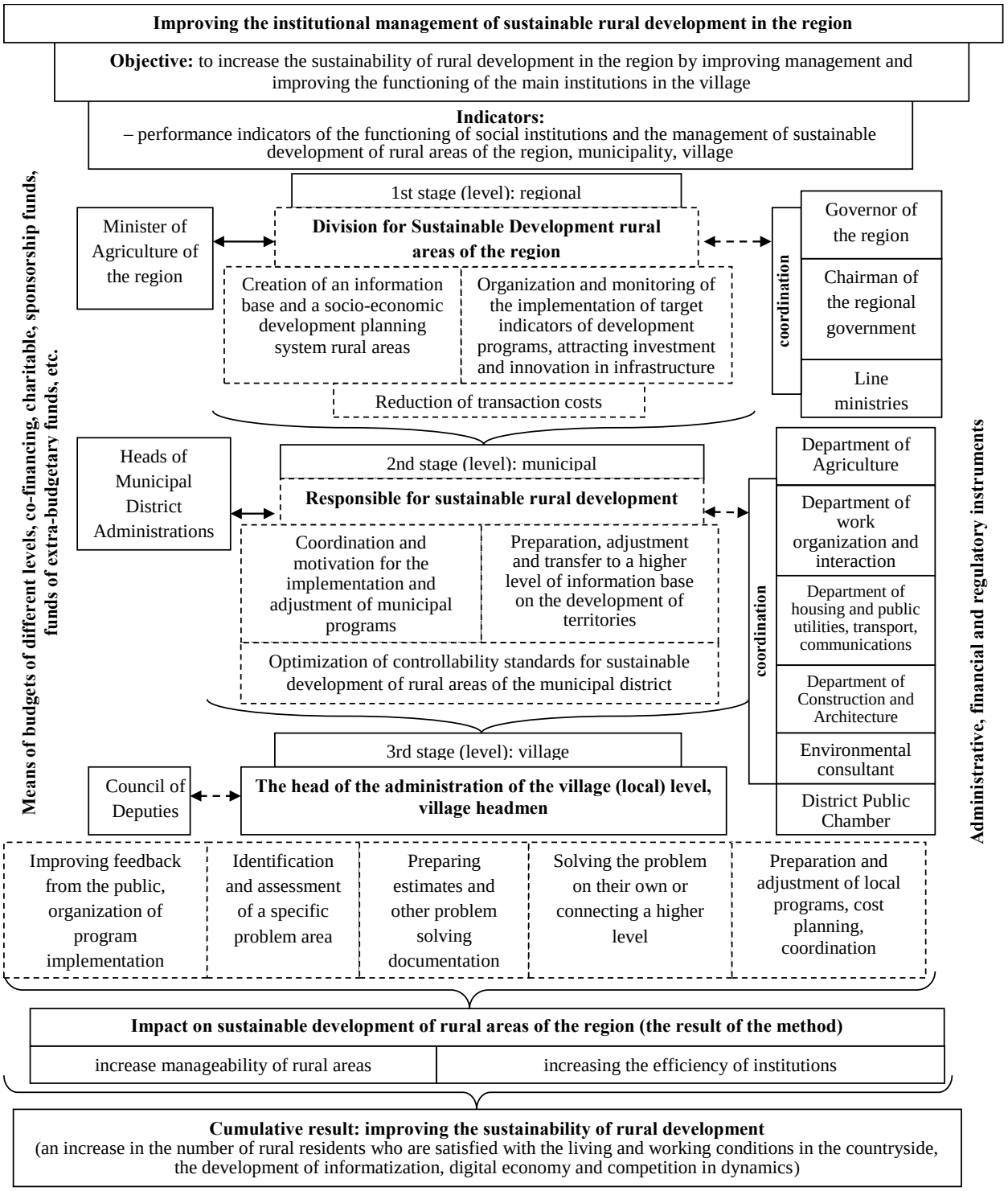


Fig. 2. Improving the institutional management of sustainable rural areas development
("---" - proposed institutions and interactions)
Source: designed by authors.

At the regional level, the Department of Sustainable Rural Development under the Ministry of Agriculture is proposed. At the municipal level, it is necessary to appoint a responsible person in this area from among the deputy heads of administration.

At the village level, these functions should be divided between heads of district administrations and elders.

All levels should have publicly accessible administrative and financial instruments to regulate rural development. In this case, it is

assumed that there will be mandatory coordination between the levels and the various institutions.

Optimizing the structure of management of rural development, we will strive to minimize the costs that already exist in an imperfect system:

$$(\sum_{1}^{n} x)^{m} + \sum_{1}^{n} a = Q \quad (1),$$

where x - is the direct factors affecting the transaction costs in this chain, m - is the number of turns (which the documents go through the chain back and forth); a - many additional factors affecting transaction costs, which are not possible to take into account when planning due to the imperfections of the existing system of driving progress of rural areas.

After the introduction of the proposed measures, the formula is simplified, since the factors "a" disappear the number of revolutions "m" decreases to 1:

$$\sum_{1}^{n} x = Q \quad (2)$$

Other things being equal, it can be assumed that costs will tend to zero when optimizing:

$$\sum_{1}^{n} x = Q \to \min \quad (3)$$

Combining processes and disparate functions by building a model of an optimal structure for managing sustainable development of territories will help optimize decision making and reduce system operating costs, eliminating cyclicality.

CONCLUSIONS

The study of institutional theories of foreign and domestic researchers gave the basis for improving the modern level of management of agricultural progress. Monitoring of the condition of rural areas revealed numerous negative trends in their progress. The regions of the Russian Federation differ not only in natural and climatic conditions, geographical location and level of infrastructure provision, but also in territorial features of rural development, which requires the formation of not only the Regional level of rural development management, but also lower local levels.

The social policy of Russia is aimed at the steadfast progress of the countryside, but nowadays it is not enough. Need to enhance the institutional management of agricultural development. The study affected the Regional, municipal and village levels of management of rural areas. For each level, an optimal coordination and management structure was proposed with a clearer division of functions that ensure effective planning, program execution, and control of the state of the territories in order to improve the quality of life in the village.

Using a proposed method on managerial practice will tend to improving the efficiency of local self-government and the management of sustainable rural development along the entire vertical of power. A clear delineation of the functions and order of coordination and responsibility by levels, the elimination of cyclicality in the management system will increase the effectiveness of planning and implementing rural development programs. This will contribute to the development of institutional ties and optimizes budgetary relations. As a consequence, the persistence of the functioning of territories, the interaction of all subjects will increase, an internal reserve of development of a specific territory will be formed, taking into account its features and potential.

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ASSESSMENT OF YOUTHS PARTICIPATION IN CASSAVA PRODUCTION UNDER THE VALUE CHAIN DEVELOPMENT PROGRAMME (VCDP) IN BIDA LOCAL GOVERNMENT OF NIGER STATE, NIGERIA

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Abstract

The study was carried out to assess youths participation in cassava production under value chain development programme (VCDP) in Bida local Government Area of Niger State, Nigeria, with the specific objectives of describing the socio-economic characteristics of the VCDP participants, costs and returns, level of youths participation and factors influencing youth participation in the VCDP. A multi-stage sampling technique was used to select 100 young cassava farmers and data collected were analyzed using simple descriptive statistics and probit regression analysis. The level of profitability was measured using gross margin and net farm income analysis. The results obtained shows that farmers in the study area had low formal education and were mostly married males with an average age and household size of 32 years and six (6) persons respectively. The gross margin and net farm income were ₦109,050.00 and ₦103,450.00 per hectare, respectively. The level of youths' participation under the VCDP was moderate and this was influenced by their age, gender, level of education, marital status, household size, farming occupation and cooperative membership. The major constraints faced by the farmers includes: poor extension agents/farmers' ratio, inadequate capital and lack of market linkage. To this end, it was recommended that change agents should enlighten farmers on the benefit of VCDP and functional cooperative that could facilitate credit and group dynamism.

Key words**:** *Value Chain Development Programme (VCDP), Cassava, youths, probit model*

INTRODUCTION

The agricultural sector is one of the most key non-oil sectors in Nigeria and it is the largest employer of 70% labour force [6]. Despite several interventions such as the *Fadama* I, II, and III, and ATAP (Agricultural transformation Agenda) high productivity have not been achieved the sector is still characterized with low yields, low level of inputs and limited areas under cultivation due to government dependence on mono-cultural economy based on oil [3]. In order to explore the huge potentials of agriculture in the country across the value chain of commodities, the Federal Government of Nigeria implemented a six years Federal Government of Nigeria/International Fund for Agricultural Development (FGN/IFAD) assisted VCDP in six states of Anambra, Benue, Ebonyi, Niger, Ogun, Taraba, and in five Local Government Areas each in all the States with a total sum of USD 104.4 million approved on October, 2012 as start up fund. The programme is aimed at directly improving the livelihoods of approximately 17,480 household (15,000 smallholder households, 1,680 processors and 800 traders) and to benefit indirectly approximately 22,000 household (FGN-VCD-Programme Implementation Manual 2014).

The primary target groups of the programme are; (i) poor rural households engaged in the cassava and rice value chain (VCs) who with not more than 5 hectares of land under cultivation; and (ii) small-scale processors (processing capacity of an average of 2MT/day for cassava and 4MT/day for rice)

and traders, with emphasis on women and youth as principal groups. The programme takes holistic and demand-driven approach to addressing constraints along the cassava and rice value chain. The objective is to sustainably enhance rural incomes and food security through the provision of improved inputs such as seed, fertilizer, agrochemicals, machineries, improved extension services as well as improved processing and packaging (FGN-VCD-Programme Implementation Manual 2014).

Cassava (*Manihot esculenta*) is a starchy root crop and a major source of food security in Africa because of its ability to grow in low-quality soil, its resistance to drought and disease, and flexible cultivation cycle [4] [12]. According to [1], Nigeria is the world's leading cassava producer with about 21 percent share in the global market. A small fraction of cassava output in the country is produced for commercial use in the livestock feed, ethanol, textile, confectionery, and food industries, while the majority is produced by smallholder farmers for subsistence or small scale processing in form of granules, pastes, flours etc. or consumed as a green vegetable, which provides vitamin A and B. Cassava tubers can be stored underground until needed thus making it an ideal food security crop [8]. Cassava is the most widely consumed food staple in Nigeria [12].

Youth (the state of being young) is an in-between period in personality development that bridges the years between childhood and adulthood [1]. Youths are the successor farming generation and therefore the future of food security in Nigeria. Youths sometimes have their farms and on the other hand complement parents' farm effort by supplying labour in almost all the farm operations. Youths are innovative and easily adopt technologies.

However, despite the contributions of youths to household agriculture, there exist little empirical data to back it up thus, an assessment on the level of youths participation in VCDP becomes relevant. This is necessary in order to design appropriate intervention policies and redesign strategies for the achievement of the existing policies. To this end, this study aims at assessing the determinants of youths' participation in cassava production under the VCDP in Niger State, Nigeria. Specifically, the objectives of the study are to:

-describe the socio-economic characteristics of the VCDP participants,

-determine the costs and returns of the cassava farmers under VCDP,

-assess the level of youths participation in the programme,

-examine the factors influencing youth participation in the VCDP,

-identify the constraints limiting youths' participation in the programme.

MATERIALS AND METHODS

Study area

The study was conducted in Niger state, Nigeria. The state is situated in the middle belt zone of Nigeria and lies within latitude $3^{o}20^{1}$ E and longitude 8^{o} and $11^{o}30^{1}$N [6]. Niger state is bounded by Sokoto, Kebbi, Kogi, Kwara, Federal Capital Territory Abuja and Kaduna State in the North, West, South, South–West, South-East and North-East, respectively. The population of the state according to 2006 census figure was about 3,950,249 however, going by the annual population growth rate of 2.5 percent in Nigeria, the population of Niger State was projected to be 5,556,200 people by the end of the year 2016 [7]. In the same vein, over 80 percent of the land in Niger State is suitable for agriculture thus, nearly 90 percent of the population engaged in arable farming in the State. Niger State has the capacity to produce most of Nigeria's stable crops. It also has ample opportunities for grazing, fishing and forestry.

However, the major crops cultivated in the state include; cereal, legumes, yam and cassava. Other crops: vegetables, livestock and aquaculture are also raised by the farming households.

Sampling Procedures and Sample Size

A multi-stage sampling technique was used to select respondents for this study. The first

stage involves purposive selection of Bida Local Government from zone 'A' area of Niger state based on cassava farmers participation in the VCD Programme. The second stage involves random selection of eleven (11) out of the seventeen (17) cassava farmers groups in the VCDP. The third stage was the selection of young farmers from the selected groups, thus, 100 young farmers were randomly selected using the Yamane formula for appropriate sample size selection. The distribution of the respondents in the study area was as presented in Table1 and the Yamanne's formula is mathematically expressed as:

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

where:
n= samples size,
N= finite population,
e= limit of tolerable error (0.05%),
l= constant.

Table 1. Sample Frame for youth farmers in cassava production Bida LGA under VCDP

LGA	Farmers Associations	Sampling frame	Sampling size
Bida	Sokomajino camps	5	4
	Emishiru camps	10	7
	Falalu camps	12	9
	Amab camps	5	4
	Alpha camps	16	12
	Ndakama camps	20	15
Limamsagi camps	24	18	
	Migibbo camps	19	14
	Cincinfarmers' cooperative	6	4
	Baley camp Ltd	11	8
	Imoku camps	7	5
Total	11	135	100

Source: International Fund for Agricultural Development (2018).

Method of Data Collection

Primary data were used for this study. The data were obtained using a well-structured questionnaire with the assistance of trained enumerator. Information was sought on farm input, output and their prices.

Method of Data Analysis

Data were analyzed using descriptive statistics, farm budget analysis and probit regression models. A farm budgeting analysis is a tool used to determine the level of resources used and the output realized in any given enterprise. Farm budgeting analysis was used to determine the profitability of cassava enterprise of the farmers in the study area. The gross margin (GM) and the net farm income (NFI) are expressed in equation 1 and 2.

GM = GI- TVC (2)

where:
GM = Gross margin (₦)
GI = Gross Income (output multiplied by unit price of the product) (₦)
TVC = Total variable cost (₦)

NFI = GI – TVC +TFC (3)

where:
NIF = Net farm Income (₦)
TFC = Total fixed cost (₦)
The probit regression model was utilized to examine the factors influencing youth's participation on cassava farming under VCDP. The probit regression model is implicitly stated as:

$Y^* = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, \ldots + e)$ (4)

where,
Y_i^* = level of participation= 1 High participation (0.51 -1.0) and 0= Low participation (0 - 0.50)
e = error term X_1 – X_{13} = as defined in equation (ii) above
X_1 = Age of respondents (years)
X_2 = Gender of respondents (male=1, female=0)
X_3 = Level of education (years)
X_4 = Marital status (dummy 1, 0)
X_5 =Major occupation (dummy 1, 0)
X_6 = Farm size (in hectares)
X_7 = Cassava farming experience (years)
X_8 = Household size (number of person)

X_9 = Access to credit (dummy 1, 0)
X_{10} = Total output (kg)

RESULTS AND DISCUSSIONS

Socio-economic Characteristics of the Respondents

Socio-economic characteristics plays important role in farmers' decisions-making processes in any production enterprise. These attributes such as; gender which help to identify the involvement of males and females in farming operations, age which account for farming experience, marital status which contribute to household size, educational attainment and farm size all have impact on farmer's participation in development programs.

Table 1 revealed that over one-third of the farmers (45.0%) were below 35 years with the average age of 32 years. This implies that, farmers in the study area were still in their active age and therefore constitute readily available labour force in cassava production. Similarly, (84.0%) of the farmers had been into cassava production for the past six (6) years with average farming experience of 11 years which is an indication that farmers in the area had relatively good experience in cassava production. The result therefore, conforms to the cultural belief that 'almost every rural person is a farmer from birth'. And this assertion is further supported by the findings of [9] who reported that, the average age of respondents in the rural areas of Abia State was 40years. The table also revealed that majorities (80.0%) of the farmers were male while female farmers accounted for only 20.0%. This is perhaps due to the cultural and religious restriction that tends to place females to mere household keepers rather than participating in strength-demanding farming activities. This result is also consistent with the findings of [9] who reported that majority of the farmers in Abia State were male.

Equally, majority (99.0%) of the farmers were married thus, are likely to have larger family labour to support cassava production. This result corroborate with the findings of [10] who pointed out that, married persons were more involved in farming activities due to higher food demand in the household. Similarly, farmers with household size of between 6–10 persons in the area accounted for 88.0% while the mean household size of the sampled farmers was six (6) persons. This finding corroborate with the result of [2] who reported that average household size among the rural migrant farmers in Maiduguri Metropolis was eight (8) persons.

The result further revealed that majority of the youths had Non formal (40%) and primary education (34%). The non formal education could be related to skills acquisition pattern of education or training programs. While only 11% of the respondents attended tertiary education. This implies that, there is low level of literacy among the youths in the study area and this may limits their level of awareness on improved farming techniques and the benefit of VCD programmes. This finding agreed with [11] who reported that personal characteristic especially, education influences adoption of new technology and this tend to increase the rate of crop production among the rural people.

Table 2. Scio-economic characteristics of cassava farmers under VCDP

Variables	Frequency (100)	Percentage	Mean
Age(years)			
≤25	12	12.0	32
26-30	33	33.0	
31-35	31	31.0	
36-40	24	24.0	
Cassava farming experience			
≤5	16	16.0	11
6-10	46	46.0	
>10	38	38.0	
Gender			
Male	80	80.0	
Female	20	20.0	
Marital status			
Single	1	1.0	
Married	99	99.0	
Household size			
≤5	12	12.0	6
6-10	88	88.0	
Educational level			
Non formal	40	40.0	
Primary	34	34.0	
Secondary	15	15.0	
Tertiary	11	11.0	

Source: Field survey, 2017.

Cost and Return Analysis

Cost and returns analysis is an attempt to show how profitable the cassava production was in the study area. In the production system, costs are usually incurred on input just as returns and income are generated from the sales of output produced. Production cost consists of fixed cost and variable cost, either of these in the African context could be cash or non-cash cost [12]. Table 3 shows the costs and returns to cassava production of the VCDP farmers.

The result shows that, the variable costs constituted the highest share of costs of production (₦209,950.00) while fixed cost is₦5600.00.00. Cost of labour accounted for the highest share (46.68%) of variable cost in cassava production, this is followed by the cost of fertilizer (16.19%).The gross margin and net farm income were ₦109,050.00 and ₦103,450.00 respectively. This implies that cassava production is profitable in the study area. While the return per naira invested was ₦0.47. This implies that for every ₦1.00 cost incurred on cassava production, ₦0.47 was earned.

Table 3. Cost and Return of Cassava Production per Hectare

Variables	**Amount (₦)**
Variable cost	209,950.00
Fixed cost	5600.00
Total cost	**215,550.00**
Gross income	**319,000.00**
Gross margin GI – TVC	109,050.00
Net farm Income GI – TVC + TFC	103,450.00
Return Per variable cost NFI/TVC	0.49
Return Per Naira Invested NFI/TCP	₦0.47

Source: Field survey, 2017
Note: 1 USD is equivalent to ₦360 as at 2017.

Level of youth's participation in VCDP

The results in table 4 shows that youths in the study area do not have enough motivation to aid them participate highly in cassava production practices under VCDP. Youths participation in Value Chain Development Programmes is relatively moderate (41%). Only 26% of the youths participate in all the recommended practices under the VCDP while majority (74%) rarely participate in more than four (4) programmes. This result could be due to lack of awareness on the benefit of VCDP in the area or the conservative mindset of the rural people which tend to make them suspicious of most developmental initiatives.

Table 4. Level of youths' participation in VCDP

Participation level	**Frequency (100)**	**Percentage (%)**
Low participation (1-2)	33	33.0
Moderate participation (3-4)	41	41.0
High participation (5-6)	26	26.0

Source: Field survey, 2017.

Factors influencing youths participation in VCDP

The result of probit regression analysis in Table 4 revealed the determinants of youth's participation in cassava production under the value chain development programmes in Bida local Government Area of Niger State. The result showed Pseudo R^2 of 0.3798 implying that about 37% of variations that occurs in youth participation were explained by the independent variables included in the model, while the remaining 63% could be due to other externalities outside the control of the researcher. The chi–squared statistic of 42.72 was significant at 1% level of probability indicating the goodness of fit of the overall model over all fitness of good. From the t values, six variables (age, gender, cooperative membership, farm size, household size and major occupation) out of the ten (10) variables included in the model were statistically significant at 1%, 5% and 10% level of probability.

Age had negative coefficient and statistically significant at 1% probability level implying that age of the respondents had inverse relationship with youths' participation in VCDP. Thus, as the youths advance in age, the probability of their participation in VCDP decreases. This could be due to the fact that

older people rarely view VCDP as a yield improving programme as such should be reserved for young farmers. This finding is in agreement with [13] who reported negative relationship between age of the respondents in their study area and rural participation in social capital formation suggesting that participation declines with age.

The result further revealed that, household size had positive coefficient and statistically significant at 10% probability level implying that household size had direct relationships with youth's participation in VCDP. Increase in household size of the young farmers will increase the probability of their participation in VCDP. This is consistent with the norm of rural areas where farmers keeps larger household size in other to acquire family labour for farm operation. This finding is further supported by the study of [11] who reported that household demographic characteristics play significant role in enhancing rural participation in social capital formation as it affects their welfare.

Table 5. Probit regression analysis on the factors influencing youths participation in VCDP

Variables	Coefficient	Standard error	Z	p>|z|
Years of education	0.0183671	0.0408281	0.45	0.653
Household size	0.1775482	0.1036959	1.71*	0.087
Major occupation	-0.6819451	0.4009282	-1.70*	0.089
Farming experience	0.0154169	0.0909052	0.17	0.865
Farm size	2.972172	1.327142	2.24**	0.025
Access to credit	0.0000226	0.0000213	1.06	0.288
Gender	1.348281	0.3945397	3.42***	0.001
Cooperative	1.27844	0.4314515	2.96***	0.003
Age	-0.2312964	0.0786731	-2.94***	0.003
Output	0.0004805	0.0004212	1.14	0.254
Constant	3.130848	2.025453	1.55	0.122
Number	100			
LR chi2(8)	42.72***			
Prob> chi2	0.0000			
Pseudo R2	0.3798			

Source: Field survey, 2017.
***= Significant at (1%), **= Significant at (5%), *= Significant at (10%)

Furthermore, cooperative membership had positive coefficient and statistically significant at 1% probability level implying that cooperative had direct relationships with youth's participation in VCD programmes. This shows that cooperative membership increases the probability of the youths participating in VCDP which conform with the *apriori* expectation that farmers acquires ease in production through participation in informal networks and registered organizations. Membership in an organization can stimulate investment in cassava production under the VCDP. This is also in line with [13] who reported that village with more social capital network are more likely to enjoy advanced agricultural practices and participate in communal activities and these in turn increases their income. Similarly, farm size was positively significant at 5% probability level implying that a probability increase in farm size will lead to corresponding increase in youth's participation in VCD programmes. This is expected as the farmers increased their area of cultivation which could translate to increased income.

Equally, sex had positive coefficients and significant at 10% level of probability implying a direct relationship with participation in VCDP. This implies that male folks participate in VCDP than female folks. This is not surprising considering the drudgery nature of farming activities and the socio-cultural and biological nature of women which tend to limit them to domestic functions. In the same vein, the result showed that farm occupation under the VCDP was negatively significant at 1%. This implies that farming as an occupation by the youths had

inverse relationship with participation in VCDP. Therefore, the probability of youths who consider farming as their primary source of livelihood participating in VCDP is less likely. This could be due to the fact that most rural farmers are conservative and rarely view VCDP as an alternative to boasting their production in the near future.

Constraint limiting young farmers participation in VCDP

Despite the success recorded, the VCD programme is however not deprived of challenges. Table 5 shows the various constraints faced by the farmers under the programme. These constrains were derived using a 3-point Likert type of scale to categorize the level of seriousness, and a mean score of two (2) was used as the decision rule.

Table 6. Showing constraint limiting youths participation in VCDP

Constraints	Very serious	Serious	Not serious	Weighted Sum	Mean	Rank
Inadequate capital	99(99.0)	1(1.0)	0(0.0)	299	2.99	1st
Small farm size	31(31.0)	69(69.0)	0(0.0)	231	2.31	10th
Old age	50(50.0)	50(50.0)	0(0.0)	250	2.50	5th
Inadequate Extension service	98(98.0)	1(1.0)	1(1.0)	297	2.97	2nd
Inadequate knowledge of VCDP	98(98.0)	1(1.0)	1(1.0)	297	2.97	2nd
Problem of land ownership	8(8.0)	91(91.0)	1(1.0)	207	2.07	12th
Lack of organized cooperative	50(50.0)	50(50.0)	0(0.0)	250	2.50	5th
Problem of transportation	2(2.0)	98(98.0)	0(0.0)	202	2.02	13th
Inadequate farm inputs	36(36.0)	64(64.0)	0(0.0)	236	2.36	9th
Lack of subsidy on farm input	48(48.0)	51(51.0)	1(1.0)	247	2.47	7th
Lack of continuity on VCDP	46(46.0)	54(54.0)	0(0.0)	246	2.46	8th
Inadequate storage facilities	30(30.0)	69(69.0)	1(1.0)	229	2.29	11th
Inadequate market linkage	98(98.0)	1(1.0)	1(1.0)	297	2.97	2nd

Source: Field survey, 2017.

The study reveals that inadequate capital is a serious constraint among the respondents. This is expected considering the fact that these farmers used mainly their personal savings in production. This result corroborates with the findings of [12] who reported that 50.3% of the respondent in his study claimed inadequate capital is a severe constraint to youth's participation in agricultural programmes. The result also shows that inadequate market linkage (98.0%) is a major constraint to engagement in the VCDP which also corroborate with the findings of Mathew and [5] who reported that 31.4% strongly agreed that lack of market is a major constraint in rural participation in agricultural programmes. Similarly, majority of the respondents claimed that inadequate Extension services and inadequate knowledge of VCDP also limit youth participation in value chain development programmes.

CONCLUSIONS

Based on the findings of this research work, it can therefore be concluded that cassava farming was mostly undertaken by youths within the age range of 26 – 35 years and low level of formal education. Similarly, cassava production was found to be a highly profitable and high yielding venture considering the net farm income and the gross margin analysis. However, youths' level of participation in the VCDP was relatively moderate.

Therefore, in other to enhance youth's participation, it was recommended that

change agents should enlighten farmers on the benefit of VCDP through the regular sources of information in the area. Farmers should also be motivated to operate a functional cooperative that could facilitate credit and group dynamism.

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TECHNICAL AND TECHNOLOGICAL SUPPORT FOR GRAIN STOCKS MANAGEMENT OF AGRICULTURAL PRODUCERS IN THE CONDITIONS OF ELEVATOR CAPACITY DEFICIENCY IN UKRAINE

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Abstract

The article proves the prospects of grain production in Ukraine and defines that the implementation of the production potential of the industry is slowed by insufficient technical and technological parameters as well as outdated grain storage facilities. The problem of disproportion between the potential volume of grain production and the certified grain storage facilities in Ukraine requires the search for alternative options of technical and technological support for grain stocks management. The method of identifying territorial reserves for the construction of elevator facilities is proposed based on the integral estimation of the proportions between the parameters of the grain offer and the possibilities of its storage across different regions of Ukraine with the corresponding mapping visualization. Alternative options for grain stocks storage based on producers' point of view are considered, and the use of Argentine grain storage technology is proposed for domestic agricultural enterprises that are unable to provide themselves with their own modern grain silos. Feasibility study on the use of Argentine technology has been carried out and its benefits for enterprises with limited financial resources have been identified.

Key words**:** *grain, stocks management, grain storage capacities, financial resources, Argentine technology*

INTRODUCTION

The chosen by Ukraine path towards European integration means that the country's economy has to focus on those sectors that determine its international specialization and the development of which can give a hefty boost to the country's economic rebirth. Agroindustrial complex is among these priorities and, in particular, the grain production, which is the basis of the country's food security and the raw material base for many other sectors of the economy. The grain industry has a significant export potential and, accordingly, makes provision for an increase in foreign exchange earnings in the country. Specifically, in 2014, among the countries of the world, Ukraine ranked second in terms of grain export volumes, stepping back only to the USA, while domestic agro-industrial complex was the first in terms of the size of foreign exchange earnings to the state budget, leaving behind the traditionally export-oriented metallurgical industry. But if Ukraine exported 33.4 million tons of grain and products of its processing in 2014, and 38.3 million tons in 2015, already in 2016 export volumes increased to 41.5 million tons [1, p.36], while at the same time the potential of domestic grain production in 2018 estimates to 70.2 million tons, compared with 66.1 million tons collected in 2016, which was a record for Ukraine.

Enhancement of grain crops yields and efficient grain logistics, as well as improving of the state-owned enterprises management and renewing the storage facilities, transportation and port trans-shipment of grain masses - all this can increase grain production parameters to 90-100 million tons, and in some strategies - up to 120 million tons per year. However, unless a systematic approach is used for the development of this industry these ambitious strategic programs aimed to increase annual grain production in Ukraine will remain just a populist call.

Among the most obvious problems ranks the disproportion between the existing capacity of certified elevators with an annual storage volume of 31.5 million tons and the declared grain offer parameters.

Theoretical and methodological foundations of the stocks management systems were studied in foreign works by Bowersox and Closs [2], Linders and Firon [8], as well as in the works of Ukrainian scholars Velychko [14], Perebyinis [10] and others. These studies are mostly of a general scientific nature and do not reflect the peculiarities of stocks management in a sectoral way.

On the other hand, well-grounded researches of the development problems of the agrarian and grain economy in Ukraine, implemented by Boyko [3], Lobas [9], Shpychak [11], Yurchyshyn [15] and other scientists contributed to the creation of a powerful domestic grain industry with significant potential for dynamic growth. Yet, the issues of technical and technological support for grain stocks management, the parameters of which have recently considerably increased, remain beyond the attention of researchers.

MATERIALS AND METHODS

The purpose of this article is to look for alternative grain storage technologies and their feasibility study in the grain management system of agricultural producers in view of the objectively existing elevator capacity deficiency in Ukraine.

In the furtherance of this goal, the following tasks have been tackled: developing a methodology for identifying territorial reserves for the construction of elevator facilities on the basis of an integral estimation of the proportions between the parameters of the grain offer and the capacities of its storage across different regions of Ukraine with the corresponding cartogram vizualization and propose an estimated indicator.

On the basis of the dialectical approach of objective reality cognition and using the comparison technique, we can assess the availability of elevator capacities and the efficiency of grain storage in Ukraine based on qualitative and cost criteria. Estimated-constructive method was used to determine the cost of implementing the Argentine technology of grain storage. Using monographic research method in assessing the technical and technological support of grain stocks management for agricultural farmers, the abstract logical method of research was used for theoretical generalization of scientific research results and the formation of opinions and suggestions.

RESULTS AND DISCUSSIONS

In terms of the logistical chain, which provides the transfer of grain flows, considerable attention should be paid to the structural provision of the grain storage system. As an integral part of the logistical process, it determines the nominal capacity of the logistical system, since the implementation of grain production potential in Ukraine (at the level of 100-120 million tons per year), as indicated, is slowed by insufficient parameters of grain storage capacities.

In Ukraine, grain storage is provided by the following structural divisions that, based on their subordination, can be grouped into enterprises: the State Joint Stock Company "State Food and Grain Corporation of Ukraine" (PJSC "DPSKU"), the State Agency of Ukraine Reserve (SARU), the State Joint-Stock Company (DAK) "Khlib Ukrainy" ("Bread of Ukraine"), as well as private owners of specific elevators and elevator networks. It should be noted that the grain storage system will be analyzed in terms of certified facilities that have passed the state procedure of compliance with certain standards. Without doubt, most elevators outlived its usefulness, their equipment does not fit into European and world estimates, but for effective and real changes, it is necessary to objectively assess the condition of the whole system. It is practically impossible to consider all grain storage capacities that are not certified, but still used by agricultural producers, since they can include a simple canopy over an asphalt-like site, where grain

is stored in bulks in some remote farm. Obviously, there are no statistics of such "capacities".

As of December 1, 2018, Ukraine has 761 certified enterprises belonging to the above-mentioned organizational structures. A significant number of elevators have been operating since the Soviet Union and now outlived their usefulness. Because of improper storage of grain, losses account for about 15% of the yield, and storage costs are substantially increasing [7]. At the same time, most elevators have predominantly floor storage containers for grain (54%) and can provide much less shipment volumes than enterprises equipped with modern vertical silos (46%) [6]. Thus, the average grain loading volumes in railway carriages on large elevators in Ukraine can serve about 12 carriages a day, while the optimal number shall comprise 54 carriages and more.

In order to study the proportionality between the formation of grain offer and the provision of its storage across territories, we have to calculate the grain production volumes in the regions of Ukraine. However, for this purpose, there's no sense to use absolute indicators of grain production volumes, but rather relative - production per unit of the region's area. Similarly, it is possible to calculate also the region's provision with grain storage capacities. By comparing the relative values of grain production we obtain ***the coefficient of local provision of grain storage capacities (Ks):***

$$Ks = \frac{Ne}{Pg}$$

where *Ne* stands for the number of certified grain storage capacities per 1 km^2 of the territory, t/km^2;

Pg – the amount of grown grain per 1 km^2 of the territory, t/km^2.

This indicator helps to integrally assess the existing potential of elevator capacities in the regions and identify "bottlenecks" or the priority investment directions. Output data for calculation and the direct calculation of the coefficient of local provision of certified grain storage facilities across different regions of Ukraine are presented in Table 1.

If the value of the *Ks* coefficient is equal to one, this means that all the grain within the region has appropriate provision of certified facilities for its storage. At the same time, it is necessary to allow a certain convention of such assumption, since the logistics of grain flows is not limited to administrative boundaries of the regions, and the grain producers that are territorially located on the border of the region can use the services of the closest elevators, including those located in the neighboring region.

The comparative analysis of the total volumes of grain production and certified containers for its storage shows a significant lack of the latter, since all coefficients are considerably lower than one, except for the Mykolaiv and Odesa regions, where the main port transshipment capacities of Ukraine are located. While analyzing the indicated ratio, it is necessary to take into account the uncertified warehouses, which in the vast majority do not provide the proper conditions for the storage of grain stocks.

For visualization of the territorial provision of Ukraine's regions with grain storage capacities we shall use the corresponding cartogram, but before that we will group the regions according to the calculated values of the *Ks* coefficient.

The number of groups (*n*) will be determined by the Sturges approximation formula [6]:

$$n = 1+3{,}322 \log N,$$

where *N* stands for the number of observations (regions).

The resulting value of n is 5.64 groups, or ≈ 6 groups.

To determine the interval (*i*) we shall use the following formula:

$$i = (x_{max} - x_{min})/n,$$

where x_{min} - the minimum value of the sign;

x_{max} – the maximum value of the sign.

Substituting in the corresponding formula the maximum value of *Ks* (1.153) for Odesa region (Table 1) and the minimum value for Transcarpathian region (0.074), we will get an interval that equals to 0.18. Using the method of equal intervals, based on this characteristics we can group together the six groups that are included in the formed closed intervals (Table 2) with a subsequent illustration of these regions on the cartogram (Figure 1).

Table 1. Output data and the calculation of the coefficient of local provision of grain storage capacities in the regions of Ukraine

Region	Territory area, thousand km^2	Average grain production (all categories of households), thousand tons (2013-2015)	Maximum value of grain production, thousand tons.	Number of grown grain in the calculation for 1 km^2 of territory *Pg*, t / km^2	Total capacity of certified grain storage facilities in 2017, thousand tons.	Number of certified grain storage facilities in the calculation for 1 km^2 of territory *Ne*, t / km^2	**Coefficient of local provision of grain storage capacities, *Ks***
AR Krym	26.1	1,256.1	1,988.2	48.13	988.1	37.86	**0.787**
Vinnytska	26.5	2,953.0	4,852.3	111.43	2,376.5	89.68	**0.805**
Volynska	20.1	753.1	922.0	37.47	272.0	13.53	**0.361**
Dnipropetrovska	31.9	2,578.3	3,710.3	80.82	2,139.4	67.07	**0.830**
Donetska	26.5	1,800.8	2,551.2	67.95	1,155.0	43.58	**0.641**
Zhytomyrska	29.8	1,260.6	2,108.6	42.30	574.2	19.27	**0.456**
Zakarpatska	12.8	266.9	325.0	20.85	19.8	1.55	**0.074**
Zaporizhska	27.2	1,828.0	3,093.7	67.21	1,356.5	49.87	**0.742**
Ivano-Frankivska	13.9	450.4	677.6	32.40	112.9	8.12	**0.251**
Kyivska	28.1	2,272.4	3,343.0	80.87	1,498.8	53.34	**0.660**
Kirovohradska	24.6	2,504.8	3,781.4	101.82	1,621.8	65.93	**0.648**
Luhanska	26.7	1,149.7	1,876.5	43.06	947.9	35.50	**0.824**
Lvivska	21.8	836.9	1,186.1	38.39	328.0	15.05	**0.392**
Mykolaivska	24.6	1,904.8	2,803.8	77.43	1,977.5	80.39	**1.038**
Odeska	33.3	2,479.9	3,670.8	74.47	2,860.1	85.89	**1.153**
Poltavska	28.8	3,123.3	5,639.6	108.45	2,696.5	93.63	**0.863**
Rivnenska	20.1	768.1	1,108.6	38.21	366.5	18.23	**0.477**
Sumska	23.8	1,847.6	3,588.1	77.63	1,515.4	63.67	**0.820**
Ternopilska	13.8	1,423.1	2,228.9	103.12	709.8	51.43	**0.499**
Kharkivska	31.4	2,327.2	4,201.5	74.11	2,201.7	70.12	**0.946**
Khersonska	28.5	1,646.6	2,792.4	57.78	1,470.9	51.61	**0.893**
Khmelnytska	20.6	1,945.3	3,039.5	94.43	1,053.4	51.14	**0.542**
Cherkasska	20.9	2,538.6	4,068.5	121.46	1,829.8	87.55	**0.721**
Chernivetska	8.1	506.6	625.5	62.54	203.7	25.15	**0.403**
Chernihivska	31.9	1,856.2	3,123.6	58.19	1,196.7	37.51	**0.645**
Ukraine	**603.5**	**42,278.8**	**63,051.3**	**70.06**	**31,473.0**	**52.15**	**0.744**

Source: Own calculation on the basis of data [13].

One more clarification regarding the content of the coefficient of local provision of grain storage capacities is the objectively existing dynamics of stocks, according to which the grain of different types of crops comes into storage and is used gradually during the marketing year. This means that proportionality (*Ks* = 1) can be ensured only at the time of filling the elevators with the harvested yields, and the first use of grain will cause an increase of the coefficient (*Ks* > 1), thus creating an excess capacity. However,

despite of the warnings in general, Fig. 1 shows proportionality between the grain raw material base and the available capacities for its storage. The analysis of cartogram illustrates the lack of modern certified elevator complexes on the state level, especially in the western regions of Ukraine (Table 2, Fig. 1).

Table 2. Ukraine's regions grouping by the coefficient of local provision of grain storage capacities, *Ks*

Group	Legend	Group interval	Regions in closed intervals
I		0,074 – 0,254	Zakarpatska. Ivano-Frankivska
II		0.255 – 0.434	Volynska. Lvivska. Chernivetska
III		0.435 – 0.614	Zhytomyrska. Rivnenska. Ternopilska. Khmelnytska
IV		0.615 – 0.794	AR Krym. Donetska. Zaporizhska. Kyivska. Kirovohradska. Cherkasska. Chernihivska
V		0.795 – 0.974	Vinnytska. Dnipropetrovska. Luganska. Poltavska. Sumska. Kharkivska. Khersonska
VI		0.975 – 1.153	Mykolaivska. Odeska

Source: Own calculation.

Fig. 1. Cartogram of Ukraine's regions grouping according to the coefficient of local provision of grain storage capacities, *Ks.*
Source: created by authors.

In the agriculturally developed European countries, as well as in the USA and Canada, up to 80% of the yield is kept by its producers in silage grain storage facilities with active

ventilation, while in Ukraine this figure comprises only 1%. Some domestic producers with the sufficient financial capabilities have all conditions for using this experience, as in Ukraine, according to our estimates [6], approximately 50 enterprises offer mini-elevators predominantly of foreign manufacture (Poland, Germany, China, Italy, Spain, France, USA, Turkey) and of five domestic producers. The customers of these elevators are mainly farms with a land bank of up to 10 thousand hectares that specialize in crop production and have the resources to create their own elevator base, as well as grain traders that use them for the consolidation of grain lots at the transshipment points. However, for the vast majority of agricultural enterprises, mini-elevators are unpurchasable, since their construction costs about 3-4 million US dollars (one-time storage volume of up to 5 thousand tons of grain).

Within the grain stocks management system, compliance with the storage standards becomes of paramount importance, which in turn provides opportunities for the integration of the national grain product subcomplex of AIC into the world grain market. Certification in Ukraine also does not guarantee the use of global grain storage standards, since subjective factors and corruption element are often grounds for granting permits with violations of the Technical Regulations on Grain Composition [12].

The introduction of a procedure for grain storage facilities certification, adapted to the conditions of EU and the countries - potential grain importers, and recognized by them, will significantly increase the export potential of Ukraine, and existing local farms have to use modern technologies for yields storage that have been tested and proved efficient in world practice. As an example - the storage technology in polymeric grain sleeves, which we offer for small and medium-sized grain producers - as an alternative to powerful elevators, which can not provide storage of all volumes of grain produced in Ukraine, and as an alternative to silage grain storage facilities of agricultural producers, which also requires considerable one-time investments and quite large grain stocks for their economically feasible storage.

The choice of grain storage technology and related equipment is individual for each entity, but ultimately, the following tasks must be executed:

(i)ensuring the compliance of the grain storage system with the current sanitary standards specified by the Technical Regulations on Grain Composition [12];

(ii)protecting the conditional properties of the grain from the influence of meteoclimatic factors;

(iii)protecting the grain from pests and diseases during storage;

(iv)providing ventilation and cooling of the grain to inhibit the physiological activity of biological components;

(v)preventing mixing of different lots of grain;

(6)creating conditions for the consolidation and reduction of lots of grain;

(7)creating technical and technological preconditions for the grain accounting and remote control of its temperature. The grain storage system must ensure continuous monitoring of grain temperature, humidity, contamination by pests and diseases, and also control the smell and color of the grain and, in case of deviations, to take adequate measures.

The idea of storing grain in special flexible hermetic polyethylene sleeve-bags appeared quite recently in Argentina, where there was a considerable lack of grain storage capacities. Today, one third of the cultivated Argentinean grain is stored in this way. Subsequently, the so-called “Argentine technology” of grain storage was adopted by the countries of North America and Europe, as well as Australia and India [5].

Compared with traditional ways of grain storage, sleeve-bags have a unique advantage in terms of humidity. In a closed environment, that is a polyethylene sleeve, oxygen is gradually consumed by breathing of living organisms (O_2) and therefore the concentration of carbon dioxide (CO_2) increases. As a result, the microclimate inside the polymer bag changes and becomes unfavorable for the development of pathogens

and harmful organisms, so the grain can be stored for a longer time without the quality loss. Hermetic environment provides for decreasing of biological activity inside the grain mass, which is the main reason for self-heating of the grain. The placement of grain in the sleeve-bags takes place directly on the field and the preservation of wet grain during cold temperatures, that is, during the late autumn and winter times, naturally contributes to its cooling due to the large surface area of 4-5 thousand square meters for the grain weight of 150-200 tons.

Sleeve-bags, the length of which comprises approximately 60 m, are made of five opaque layers of polyethylene (sometimes of three), each of which has its own properties. This is necessary to ensure that the grain does not break the film with its own weight, and also so that the bag can stretch uniformly. The inner layer of the sleeve is made of black polyethylene, and the outer one is white so that the grain does not overheat in the sun. The diameter of the bag after filling is 2.7 m and it can store about 200 tons of grain. Given the minimum allowable distance between the sleeves for 1 hectare of the field, this way it is possible to store 5 thousand tons of grain.

The applicability of using sleeve-bags from logistical management options is related to the seasonality of grain production, since the peak loads on carriers and the excess offer of a new yield increase accordingly transportation tariffs and reduce purchasing prices for grain. It is not always possible to dry the grain to the necessary level due to weather conditions, since harvesting of many types of grain falls in the autumn period and the natural drying of grain is considerably complicated, and the use of drying equipment is associated with expensive heat carriers. In fact, by storing the grain directly on the field, there's no need for traditional monitoring of grain in elevator facilities, mixing it in order to avoid self-heating, as well as energy consumption for active ventilation, etc.

Costs for the introduction of Argentinean technology (Table 3) include the purchase of a corresponding set of machinery and equipment and the very sleeve-bags. According to studies [5], sleeves can be used for two years, after which polyethylene is destroyed under the influence of ultraviolet rays and the bag needs to be replaced. The package also includes a sticky tape, which allows to carry out minor repair of the sleeve sections damaged by rodents or other physical actions.

Table 3. Estimated cost of equipment, works and materials for grain storage in sleeve-bags in Ukraine

One-time investments in new equipment	**Cost**
Loading machine	$ 18,750
Discarging machine	$ 31,250
Conveyer-hopper, trailer	$ 81,250
Conveyer-hopper like "dump pit"	$ 31,250
Total one-time investments	***$ 162,500***
Annual expenses	
One bag for 150-190 t	$ 3.13 / t (given the cost of the bag $ 563)
Grain Loading Department, 6 people including mechanics	$ 0.08 / t / person is set individually in each farm
Grain Discharge Department, 3 people	$ 0.08 / t / person
Fuel costs per 1 tonne of loaded / discharged grain	$ 0.16 (given the calculation of 80 liters of diesel fuel for a full day and processing of 800 tons of grain)
The cost of storing 1 ton of grain	***Not less than $ 3.75 / t***

Source: Own calculation on the basis of data [5].

Table 3 shows the estimated costs of using the Argentine grain storage technology in Ukraine, excluding the costs associated with security, lighting of the territory, ensuring bags integrity and the purchase of consumables (ropes and strips that are used when the bags are filled). Moreover, it is necessary to carefully prepare the field for

laying sleeves, selecting perfectly plain areas with proper drainage and free it from stones, stumps, drills, metal objects, etc., which can cause the rupture of the sleeve bag. It is recommended to apply anhydrous ammonia at the chosen field to destroy rodents, and to plant grass, which will allow using the field many times without extra costs.

Although long-term experiments conducted both in Argentina and in other countries have shown that during storage in the bag no changes were reported as to the moisture content of seeded grain, it is advisable to dry the grain to the standard norms, which will guarantee a longer shelf-life. Grain humidity is optimal in the range of 14-15%, although Argentinean and American farmers consider that in the case of urgent need, it is possible to set in polyethylene bags grain maize with a high humidity up to 20%, and for feeding animals - up to 40%. Based on these data, the completely safe moisture content of grain maize is 13.6% (equal to a relative humidity of 67%), since this indicator correlates with the limit of the required condition for the development of fungal organisms at the temperature of +25 ºC [5].

The advantages of Argentine grain storage technology are as follows:

(i)relatively low investment costs for the introduction of technology with the possibility of cooperative use of machinery and equipment;

(ii)reduction of logistical costs for storage and transportation of grain masses;

(iii)the possibility of storing both dry grain and grain with high humidity, which ensures saving costs for heat-carriers in case of artificial drying;

(iii)independence from transport companies and elevator enterprises, which saves time and money;

(iv)lack of depersonalization and underestimation by elevators of grain quality (loss in price);

(v)avoidance of mixing of lots of grain, which reduces the total cost of the offer;

(vi)improvement of quality, as well as price characteristics of grain after storage due to after harvesting maturing in the sleeves;

(vii)avoiding stopping of the harvest due to lack of vehicles and free grain storage facilities;

(viii)better visualization of products in case of mortgage transactions with a bank or presentation to the insurance company's agent of a collateral for obtaining a loan.

The feasibility and economic calculations of using alternative technologies for grain stocks management of agricultural producers have shown that the use of certified elevators's services, such as PJSC "DPSKU", for grain owners at least costs $ 19.5/t/year [4], which is significantly more expensive than current costs associated with the use of Argentine technology ($ 3.75/t/year). In addition, taking away transportation costs and adding a seasonal price increase at the time of the reboxing of the bag, it is easy to calculate the expected benefits for the grain owner. Our calculations have shown that taking into account the one-time investments made (Table 3) for the purchase of machinery and equipment (corresponding depreciation charges), as well as all organizational and operating costs for the use of Argentine technology, ultimately provide up to three times lower cost of grain storage, compared to the use of certified elevators services, and also solve many organizational problems within the stocks management system of agricultural producers.

CONCLUSIONS

Ukraine is increasing grain production volumes and demonstrating its record-breaking yields in recent years, but the realization of the industrial potential of the industry is slowed by insufficient technical and technological parameters as well as outdated grain storage facilities. Ukraine has 761 certified enterprises, the total capacity of which is 31.5 million tons of grain. A comparative analysis of the total volumes of grain production and certified containers for its storage, based on the calculation of the coefficient of local support of grain storage capacities, indicates a significant shortage of the latter ($Ks<1$) in all regions of Ukraine,

except for Mykolaivska and Odesa regions, where the main state's transshipment capacities are located. At the same time, the modern silage capacities for grain storing account for only 54% of their total volume, the rest belongs to primitive storage technologies (floor and bags).

In the conditions of advanced growth rates of raw materials offer over the commissioning of new grain storage capacities, the use of non-traditional technologies for preserving the conditional properties of grain becomes a crucial issue. We recommend small and medium-sized grain producers, who have no sufficient funds to purchase own silos-based grain storage facilities, to use the so-called Argentine grain storage technology in the polyethylene sleeve-bags, which is an effective alternative for their stocks management system. Today it is the best among all known technologies of storing wet grain, not only for feeding, but also for food purposes, and the cost of storage is approximately 2-3 times lower than that of an elevator. Due to the high sealing capacity of the bag, the grain mass is self-condensed by reducing its biological activity, and storage of grain at zub-zero temperatures contributes to the natural cooling of the bag's content.

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DETERMINATION OF ENVIRONMENTAL SUSTAINABILITY AND ANTROPOGENIC LOADING IN THE TERRITORY OF THE AMALGAMATED COMMUNITY

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Abstract

The main objective of the research paper is to determine environmental sustainability and anthropogenic load in the territories of the united territorial community. Methodological basis of the research are general theoretical methods of scientific cognition, in particular dialectic method, system analysis, fundamental provisions of general economic theory. Methods of comparative and structural analysis, statistic groups were also used to analyze the level of ecologically sustainable development of regions; tabular method - for a visual representation of the dynamics of indicators. The methodology is aprobated on the territory of the Chernivtsi region. It is substantiated that the basis of sustainable development is the combination of economic, social and environmental sustainability. It has been established that the environmental factor is of the greatest concern at the moment. The reform of decentralization, which has been initiated, is partly directed at addressing environmental issues; at the same time, this process is long-term and requires significant resources. Determination of environmental sustainability and anthropogenic load on the territory of united territorial communities is important for ensuring sustainable development of rural territories. The research paper contains the calculations of the summarized values of regional environmental indicators of sustainable development and evaluates the natural and anthropogenic unsustainability of the environment. Ecologically safe, balanced and systematic development of territories is an integral part of spatial development of the region. It is the basis for solving the problem of harmonizing the goals of socio-economic development of certain territories with the principles of ecological safety of the country as a whole. Ensuring environmental sustainability and reducing anthropogenic load on the territory of the united territorial community may be due to the development of alternative energy and bioenergy. In the context of the study of this article, the development of environmental safety in a separate region is proposed as a systemic category that combines social, economic and environmental components, whose interaction involves the transition to environmentally sustainable production and consumer structures, increasing the efficiency of nature management, development of ecological infrastructure. The ecological dimension of sustainable development of rural areas is proposed to be determined using the following indicators: air quality, biodiversity, land resources, green zones, provision of the population with water, renewable energy sources, energy resources, atmospheric emissions, load on land resources, load on water resources, state of the system of drainage, radiation and ecological danger, generation of waste, waste management, participation of business entities in the formation of revenues from ecological dues, public participation in environmental protection, greenhouse gas emissions, satisfaction of the population with the state of the environment.

Key words**:** *ecology, decentralization, united territorial communities, rural territories, anthropogenic load, efficiency, land resources*

INTRODUCTION

In the conditions of decentralization and implementation of administrative-territorial reform to improve the efficiency of management of business entities and to ensure an adequate level of quality of life of the population, it is important to solve the problems of environmentally safe development in rural areas. To ensure the environmental safety of the region, it is necessary to determine the level of anthropogenic load on the territory and optimize it, this is especially relevant for rural areas. Environmental pollution, improper use of natural resource potential, insufficient level of implementation of environmental innovations are reduced to an ecological crisis, which is accompanied by a crisis of the socio-economic system of the whole regions. Therefore, special attention should be paid today to diagnosing environmentally safe

development. It is also necessary to develop and adopt managerial decisions regarding environmental production in the regions, to increase the economic efficiency and competitiveness of producers, taking into account the envoronmental factor.

In examining the issue of ecologization of production, it should be noted that energy consumption is currently an objective condition for the existence of mankind. The population is steadily increasing. Naturally, the volume of consumed resources is constantly growing. This relates to the energy resources used in all sectors of the economy and in all spheres of public life. Growth in consumption of different types of energy and resources dramatically increases on the path of industrialization and accelerated economic development. At the same time, it has environmental impacts.

Taking into account the decentralization reform initiated in Ukraine, attention is paid not only to the socio-economic development of rural areas, but also to the efficiency of the use of available resources. Therefore, determination of environmental sustainability and anthropogenic load on the territory of a united territorial community and the search for alternative energy sources for the sustainable development of rural areas are important.

In the context of today's global challenges, changes in production, consumption and logistics technologies are typical. These changes have a significant impact on all spheres of life, both in the rural and urban territories. At the same time, the environmental component takes a key place in the modern development of rural areas of the leading countries. Changes in rural areas are treated in terms of automation of production capacity within the historical development process. Regarding ecologization of production, ecological consciousness and the formation of a corresponding culture was emerging in several stages. Accordingly, a significant number of scholars were engaged in research of ecologization of production and the balanced development of rural territories and communities taking into account the environmental factor.

Blavatska D.A. investigated the specifics of the re-formation of the environmental legislation of Ukraine as the leading direction of the state environmental policy [1]. Borodina O.M., Heiets V.M. and Hutorov A.O. developed the Ukrainian model of agrarian development, its socioeconomic and environmental reorientation [2]. Veklych O.O. studied the principles of unification of the structure of domestic environmental taxation in accordance with Eurostat's classification standards [16]. The public assessment of the national environmental policy was carried out in the works of V. Melnychuk, M. Ruda and T. Malkova [10].

Significant theoretical and practical achievements on the definition of environmental sustainability and anthropogenic load on the territory of the united territorial communities are in the context of the implementation of the administrative territorial reform [3]. Economic aspects of monitoring and management of natural resources in conditions of changing market conditions and ensuring sustainable development in the context of decentralization of power in Ukraine are studied in the works of M.A. Khvesyk and S.O. Lyzun [15]. Zharova L.V. studied the prospects of stimulating "green" production under conditions of decentralization [17]. Kolmakova V.M. dealt with the specifics of financial support for the implementation of the policy of environmental safety in the newly formed united territorial communities [4]. Matsievych T.O. studied the features of environmental taxation: the practice of the EU countries [6]. The potential of Ukraine's sustainable development towards the implementation of an integration choice of the state is outlined in the writings of O.M. Alimov, I.M. Litsur and V.V. Mykytenko [14]. Pristaiko O.P. described the indicators of the effectiveness of the regional environmental policy and researched the environmental indicators of sustainable regional development in the context of radical socio-economic transformations [8, 9]. The socio-economic

potential of sustainable development of Ukraine and its regions is defined in a number of strategic development programs of the state [11]. Stroiko T.V. in his articles described the methods of monitoring the sustainable development of rural areas and explored the options for sustainable use of nature as an element of sustainable development of rural areas [12, 13]. Kostyshyn A., Tybolova L. proposed coefficients of ecological stability, corrected for the relief, which is appropriate to apply in the adoption of management and design decisions [5].

At the same time, significant changes take place in the conditions of decentralization, therefore, the issue of determining environamental sustainability and anthropogenic load on the territory of the united community requires further research. Therefore, it is necessary to further elaborate the existing legal and regulatory framework.

Formulation of the objectives of the research paper:

• Identification of indicators to be the basis for estimation of the level of environmental sustainability and anthropogenic load in the territory of the united territorial community.

MATERIALS AND METHODS

The methodology of the research is based on the following economic methods: monographic (study of best practices in the definition of ecological stability of regions), system analysis (comparison of different categories of land), statistical (analysis of the structure of land resources), graphical (schematic and table representation of research results).

RESULTS AND DISCUSSIONS

The main directions of systematic, balanced ecological development of regions, taking into account the available resource potential, in accordance with the National Paradigm of Sustainable Development of Ukraine, are increasing the well-being of the population due to provision of high-quality food products in sufficient quantities. Another component is the creation of a favourable ecologically safe environment for living and reproduction of natural resource potential. Satisfaction of these needs is possible through the formation of an ecosystem which ensures the implementation of all production functions, while not damaging the natural environment. On the part of the state, material and infrastructural stimulation of structural changes in the economy, the transition to new, innovative, environmentally safe production technologies are important for the implementation of this paradigm of sustainable development. At the same time, in the long run, the environmental factor has a leading role, since it has a significant impact on all other factors.

Environmental safety is one of the most important guiding lines for the sustainable development of both separate territorial entities and region as a whole. It ensures sustainability of the spatial system, determines the optimal level of load on the environmental component of the united territorial communities. In accordance with the concept of sustainable development, socio-economic development of the region should ensure environmental safety for the population. The conducted researches allow to state that in countries that develop any influence of economic development on the state of the environment and the state of use of natural resources is negative. The above due to the fact that is constantly increasing anthropogenic impact. At the same time, the opportunities for introducing resource-saving and environmentally friendly technologies are growing, and the level of ecological culture of the population is increasing. These changes and transformations are typical for all developed countries, and changes should be made in Ukraine as well. Implementation of the administrative territorial reform according to the model of the EU member states envisages assimilation of environmental standards of economic management and monitoring of the state of anthropogenic load on the natural environment of the united territorial communities.

In the conditions of administrative territorial reform and decentralization, it is also important to address the existing environmental problems. The initiated reform provides for the transfer of part of powers and budgets from state authoritie to the united territorial communities. It is they who will receive funds from the use of the resource potential that is located in their territories. At the same time, they also entrusted with the function of monitoring compliance with environmental protection measures, monitoring of anthropogenic load on the environment of rural territories. The main task of the reform is the transfer of powers, opportunities and resources to those bodies which are closer to the people, so that these powers can be exercized more efficiently. At present, a significant part of these powers is also associated with monitoring compliance with environmental standards.

Every inhabitant of a village or city has the right to modern medicine and education, affordable and high-quality administrative, social services, utilities, good roads, lighted streets, green environment. The existing experience of rural development suggests that people can influence the quality of these services only when the ones who are responsible for providing them are close enough.

In the conditions of administrative-territorial reform and decentralization, local self-government bodies are closest to rural residents. Representatives of the combined territorial councils should have broad powers and sufficient resources to be able to resolve all local issues and bear responsibility for them. This is one of the key conditions for effective administrative and territorial reform. To this end, decentralization is carried out in Ukraine - the transfer of powers and funds from state authorities to local self-government [15]. Accordingly, significant funds are allocated from the state budget for the implementation of the policy related to the change of administrative territorial system.

The state increases the volumes of funding of regional development every year. Since 2014, the volume of support for regional development has increased 40 times. The main sources of funds for the administrative territorial reform and implementation of socio-economic and environmental projects in rural areas are: international technical assistance of the European Union, State Fund for Regional Development, state subventions for socio-economic development of certain communities. Currently, these funds are sent directly to the united territorial communities and are used for the implementation of specific socio-economic and environmental projects.

The amounts of these funds are sufficient for the systemic solution of specific problems at the community level. For example, in 2018, UAH 167.6 million was provided for infrastructure projects of the Chernivtsi region from the state budget. The State Fund for Regional Development has funded 38 projects in the spheres of education, health care, social protection, culture, sports, ecology, etc. According to the program of administrative territorial reform, the subventions in the amount of UAH 68.3 mln for the infrastructure development were received by the united communities of Chernivtsi region. With these funds, the community will implement 90 projects, a significant number of which are associated with ecologization of production, namely the establishment of a system for collecting and recycling solid waste.

Today, the ecology of rural areas greatly worsens due to the misuse of solid household waste, the formation of unregulated garbage disposal sites, pollution of water and air. With the successful implementation of environmental projects, partial resolution of thes eproblems of rural areas and newly formed united territorial communities is expected.

Chernivtsi region is also one of the customers of the Carpathian Network for Regional Development Project, which, along with the socio-economic development of the region, involves the implementation of a number of environmental initiatives [15]. According to the Carpathian Network for Regional Development Project, the main principle of

environmentally sustainable development of the region in the context of decentralization is the transition to environmentally balanced models of production, consumption and elimination of the relationship between economic development in the region and environmental degradation. In the conditions of decentralization and implementation of administrative-territorial reform, the main role in monitoring the environmental state of the environment of rural areas is given to united communities. They have the appropriate resource and authority to do this.

To date, there is no common methodology for assessing the environmental sustainability and anthropogenic load on the territory of a united territorial community. To calculate this assessment, it is necessary to use data on specific resources available on a particular territory and to calculate the relationship between these resources and the changes that occur with their structure. Given that we are dealing with rural areas, the main resource is the land. To assess the environmental situation at the level of a particular region or community, we propose to calculate the coefficient of environmental sustainability of land use. Table 1 shows the coefficients of environmental sustainability for particular lands.

The general coefficient of environmental sustainability of a particular territory is calculated using the formula:

To environmental sustainability of the territory

$$= (Ki * Pi) / Pi * Kp$$

$$C_{\text{of environmental sustainability of the territory}} = (C_i * A_i) / A_i * C_r$$

where:

C_i – coefficient of environmental sustainability of i-type lands;

A_i – area of i-type lands;

C_r – coefficient of morphological stability of the relief [7].

Using this formula, we calculated the coefficient of environmental sustainability of the territory of Chernivtsi region. According to the State Land Cadastre, available land of the Chernivtsi region is 809.6 thousand hectares. A significant part of the territory is occupied by agricultural lands (59.5%), one third (31.9%) - by forests and woodlands, 5% is built-over lands, 2.3% is underwater and 1.4% belongs to others types of lands. Table 2 presents the structure of the available land of the Chernivtsi region and Ukraine.

Table 1. Coefficients for the calculation of environmental sustainability for particular lands

Name of lands	**C of environmental sustainability of the territory**	**C of environmental impact of the land on surrounding lands**
Built-over land and roads	0.00	1.27
Arable lands	0.14	0.83
Vineyards	0.29	1.47
Woodland belts	0.38	2.29
Orchards, shrubs	0.43	1.47
Vegetable gardens	0.50	1.59
Hayfields	0.62	1.71
Pasture lands	0.68	1.71
Ponds and marshes	0.79	2.93
Forests of natural origin	1.00	2.29

Source: [7].

Table 2. Structure of the available land of Chernivtsi region

Region	**Agricultural lands**	
	thousand hectares	**%**
Chernivtsi region	482	59.5
Ukraine	42724	70.8
Lands under forest resources		
Chernivtsi region	258	31.9
Ukraine	10632	17.6
Built-over lands		
Chernivtsi region	40	5.0
Ukraine	2558	4.2
Lands under water resources		
Chernivtsi region	19	2.3
Ukraine	2426	4.0
Other		
Chernivtsi region	11	1.4
Ukraine	2016	3.3

Source: [14].

Grouping the territory of Chernivtsi region in terms of environmental sustainabilty allowed distinguishing 4 groups of territories:

unsustainable, unstably sustainable, medium-sustainable, sustainable (Table 3).

The calculations allowed to notice that 42.3% of the territory of Chernivtsi region is environmentally unsustainable, the situation in 52.7% of the region is unstably sustainable, in 4.5% is medium-sustainable, and there are almost no environmentally sustainable territories. The proposed methodology can be used to calculate environmental sustainability and anthropogenic load of both separate region and territory of a united territorial community.

Table 3. Grouping the territory of Chernivtsi region in terms of environmental sustainability

Group No.	Environmental sustainability	Value of $C_{\text{of env. sust.}}$	%
1	Unsustainable	≤ 0.30	42.3
2	Unstably sustainable	0.31-0.50	52.7
3	Medium-sustainable	0.51-0.67	4.5
4	Sustainable	≥ 0.67	0.5

Source: own studies.

At present, the difficulty in ensuring environmentally sustainable development of regions and the country as a whole in the context of transformational processes is due to the fact that the current ecological and economic situation in Ukraine is characterized by the predominance of industries that have a significant anthropogenic impact on the natural environment. During the last decade, the industrial structure of the country has increased the importance of environmentally aggressive industries (metallurgy, fuel and energy) and reduced the share of more environmentally friendly industries (mechanical engineering, light industry). At present, a significant number of domestic enterprises do not comply with current environmental legislation, pollute the environment with waste and debris.

In the context of decentralization, the urgent issue is the solution to the problem of household rubbish, which significantly affects the environmental condition. In many territorial communities, the development of programs for dealing with solid household waste has been introduced on the basis of the Law of Ukraine "On Waste", the Law of Ukraine "On Waste", the Law of Ukraine "On Improvement of Human Settlements" and the Law of Ukraine "On Environmental Protection" higher ". These programs focus on the problem of sorting and utilization of solid domestic waste in the territories of newly created communities in order to improve the environment and living standards of the community. The implementation of this is possible due to the establishment of a system for separate collection of solid domestic wastes, the creation of an infrastructure for their sorting. At the same time, the implementation of the mentioned may-liv if the relevant explanatory work is carried out among the population of the united territorial communities, the creation of appropriate conditions and material incentives for the population.

In many territorial communities, the development of programs for solid domestic waste is based on the Law of Ukraine “On Waste”, the Law of Ukraine “On the Improvement of Settlements” and the Law of Ukraine “On the Protection of Natural Environment”. These programs focus on the problem of the sorting and disposal of solid domestic waste in the territories of newly created communities in order to improve the environment and the standard of living of the community. This is possible due to the establishment of a system for separation of solid domestic waste collection, the creation of sorting infrastructure. At the same time, this is possible provided that appropriate explanatory work is conducted among the population of the united territorial communities, the creation of appropriate conditions and material incentives for the population.

The analysis of scientific literature has shown that environmentally safe development of territorial communities is an integral part of sustainable spatial development. In our opinion, the development of environmental safety of territorial communities should be considered as a systemic category that combines social, economic and environmental

components, whose interaction provides for the transition to environmentally balanced production and consumer systems, increase of the efficiency of nature management, development of ecological infrastructure.

In order to assess and increase the ecological safety of the combined territorial communities of Ukraine, it is necessary to determine its preconditions, namely the state of the eco-logical situation. In particular, it is necessary to analyze the indicators of air pollution, water treatment and utilization of solid and hazardous waste. In Ukraine, in recent years, there has been an increase in pollutant emissions from stationary and mobile sources of pollution.

In order to assess and improve the environmental safety of the united territorial communities of Ukraine, it is necessary to determine its preconditions, namely the environmental situation. In particular, it is necessary to analyze the indicators of air pollution, water treatment and solid and hazardous waste disposal. In Ukraine, in recent years, there has been an increase in pollutant emissions from stationary and mobile sources of pollution.

The transfer of production capacity to rural areas is currently typical. The above enhances the need to monitor environmental condition. The environmental dimension of sustainable development of rural territories can be determined by the following indicators: air quality, biodiversity, urban land resources, urban green zones, quality of drinking water in the city, provision of urban population with water, renewable energy sources, energy resources, atmospheric emissions, load on land resources, load on water resources, drainage system condition, water consumption, radiation and ecological danger, waste generation, waste management, noise pollution, energy dependence, financial participation in addressing environmental protection issues, implementation of energy management, participation of business entities in the formation of revenues from ecological dues, public participation in environmental protection, greenhouse gas emissions, satisfaction of the population with the state of the environment, and environmental management performance of the organizations.

Table 4 summarizes the values of regional environmental indicators of sustainable development, where smaller values correspond to inefficient environmental policy, and greater ones characterize its growth. Indicators of Sustainable Development (^{I}sum) and Ecological Development (^{I}ec) have been identified for different regions of Ukraine (Northwest, North (Polissia), North-East, Center, Donbas, Dnipro region, South, Podillia, Bukovyna, West, Zakarpattia).

Table 4. Summarized regional environmental protection indicators of sustainable development, 2017

Region	**^{I}ec**	**^{I}sum**
Northwest	1.70	1.52
North (Polissia)	1.43	1.40
North-East	2.22	2.14
Center	3.40	2.90
Donbas	3.73	3.36
Dnipro region	4.05	3.82
South	4.27	3.54
Podillia	2.34	2.56
Bukovyna	0.59	0.73
West	0.75	1.25
Zakarpattia	2.39	1.52

Source: [9].

The indicators studied are evenly distributed in almost all regions of Ukraine, with the exception of Kyiv, Donetsk and Dnipropetrovsk regions. Critical worsening of the environmental condition is radioactive, chemical and physical pollution of air basins, surface and underground water by industrial enterprises, destruction and pollution of land. Enterprises release metals, methane, carbon monoxide, sulphur oxide, nitrogen oxide, ammonia and other refinery products into the atmosphere. The best environmental situation is observed in Poltava, Khmelnytsky, Cherkassy, Chernivtsi and Volyn regions. It should be noted that in 2018, atmospheric emissions in Ukraine were two times lower than in 2014. This trend is due to a decline in the rate of economic development in 2015 [4].

In the implementation of administrative territorial reform, a characteristic tendency is the transfer of production capacities to rural areas, which will increase the anthropogenic load on the environment. This necessitates the monitoring of anthropogenic load on rural areas. Functions for this monitoring will be assigned to non-newly formed united territorial communities.

In 2016, out of the 47 cities in the regions of Ukraine, where regular monitoring was conducted, in 22 cities the atmospheric air in terms of the integral indicator was characterized by a high level of pollution. These are the regions where powerful metallurgical enterprises, chemical and petrochemical industries, those of fuel and energy complex are located. There is a high level of air pollution in these regions [10].

The main measures aimed at reducing the anthropogenic load on rural areas united within the communities are: improvement of technological processes (including the transition to other types of fuel and raw materials); construction and commissioning of new gas processing plants and facilities; increasing efficiency of existing treatment facilities; elimination of pollution sources, which will allow reducing emissions of pollutants into the atmosphere; the introduction of other measures that will reduce the emission of pollutants into the air.

In order to improve the condition of water bodies in the united territorial communities, it is necessary to implement a number of measures aimed at stimulating the rationalization and ecologization of water use: development of innovative water-saving technologies; intensification of investment activity in the construction of modern and reconstruction of existing water treatment facilities; promotion of the development of environmentally friendly, anhydrous, recycling and reusing technologies in order to reduce the volume of contaminated wastewater and protect water sources; financial and economic stimulation of the implementation of innovative water saving projects; creation of effective market levers of ecological and economic regulation of water resources relations, which will allow ensuring adequate financing of water saving and water protection measures; introduction of a system of ecological and economic instruments for stimulating water saving production and consumption; development and implementation of water saving policy, its periodic adjustment in accordance with the processes of state development, its control and evaluation of the results of implementation of this policy; implementation of water resources management strategy.

Regarding the types of contamination of surface and underground waters, they can be divided depending on pollutants. Physical, chemical, biological and radioactive pollution/contamination is distinguished. In case of physical pollution, a significant volume of insoluble impurities in water is characteristic, namely: silt, clay and sand. Chemical contamination of water bodies involves oil and petroleum products, metals, mineral fertilizers and pesticides. Biological contamination is characterized by bacteria and viruses. Taking into account that a significant territory of Ukraine suffered from the Chernobyl catastrophe, there are reservoirs that are contaminated with cesium-137 and strontium-90, there is an excess of potassium-40.

In the conditions of decentralization it is important for newly formed united territorial communities to control the condition of available resources, including water resources. Currently, communities are actively involving available data of the existing water quality assessment systems for monitoring purposes. The most common are: Information System Analysis of Surface Water Quality of the IAC of the Ministry of Environmental Protection, which is intended for the analysis of surface waters; EcoInspector Automated Management System, which, in addition to measuring the condition of pollution of the environment, assesses the condition of water resources; the results of research of the Research Institute of Problems of Mathematical Machines and Systems of NAS of Ukraine related to water resources; data of the analytical system

Chemical Composition and Quality of Surface Waters of Ukraine; data of the Hydrosphere system.

A promising direction is currently the development of a unified methodology for assessing the condition of water resources for united communities and the introduction of monitoring and control of water use. It is relevant to use the EU experience, taking into account the provisions of the EU Framework Directive on the ecologization of agricultural production.

The main sources of revenues of environmental funds of certain European EU countries are: the National Environmental Fund, the Environmental Investment Fund, the Protection Fund Appropriation, the National Environmental Protection Fund, the Environmental Investment Center, the State Fund for the Environment, etc. (Table 5).

Table 5. The main sources of revenues of environmental funds of certain European countries during the period of accession into the EU

Fund	Country	Source of revenues
National Environmental Fund	Czech Republic	pollution charge, repayment of loans, financial transactions
Protection Fund Appropriation	Hungary	product tax, repayment of loans, privatization, transfers from the budget
National Environmental Protection Fund	Bulgaria	product tax, fines for violation of environmental protection legislation, repayment of loans
Environmental Investment Centre	Estonia	Until 1999: pollution charges, resource usage charge, privatization, lumbering charges. After 2000: transfers from the budget
Environmental Investment Fund)	Litva	pollution charges, external loans
State Fund for the Environment	Slovakia	pollution charges, transfers from the budget

Source: [16].

European experience is also relevant for Ukraine. It is important for the united territorial communities to use modern achievements on the use of domestic waste. Ways of solving the problem of waste disposal should include: formation of a modern waste management system taking into account European experience; improvement of the regulatory framework; construction of new waste incinerators and waste disposal plants; separate sorting and treatment of domestic waste; increase of fines for disposal of unsorted garbage in places which are not specially allocated for that purpose; recycling of packaging for different products; imposing restrictions on circulation of plastic products.

The implementation of alternative energy projects is urgent for Ukraine in the context of administrative and territorial reform and decentralization. These actions will improve the environmental condition and optimize the energy costs of the united territorial communities. The bioenergy model based on the processing of wood chips, which is the waste of the lumbering process, dominates in science and practice. Wood chips can become the main raw material for generating bioenergy in the united communities. In addition, one of the sources of wood chips may be low-quality wood, which is mostly lumbering waste and not used by enterprises. Implementation of the proposed solution allows to build an integrated approach to community development with the following effect: utilization of low-quality wood obtained during disafforestment, branching and accretion thinning in the forestry, especially after forest fires; solving of financial tasks for branching and accretion thinning in forestry by their inclusion in the integrated bioenergy production budget; ensuring forest protection contributing to the cultivation of highly resistant plants, which effectively perform the protective function of the forest; creation of new jobs at bioenergy facilities (supply of raw materials, operation and maintenance of energy production facilities), generation of cheap energy for the needs of the population of the united territorial communities.

CONCLUSIONS

The results of the study show that the level of environmental safety in Ukraine and its regions is insufficient, and measures for its improvement are not fully effective. Diagnostics of environmentally safe development of the regions of Ukraine was the basis for determining the asymmetry of its constituents and basic environmental problems, which are characteristic for certain regions of Ukraine. Implementation of measures to improve the condition of atmospheric air, water bodies and addressing the problem of waste disposal will promote not only the ecological and economic efficiency of enterprises, but will also ensure sustainable and balanced economic growth in the regions of Ukraine.

Proceeding from the main tendencies of negative changes in the state of the environment in Ukraine and its regions, we see the need for ecologization of production, that is, the introduction of resource-saving and environmentally friendly technologies and technological processes, methods of rational management of natural resource potential. These will ensure, along with the maximum possible quality of public product. The ecological development at the present stage should be the transition from the implementation of certain environmental measures to the development and implementation of the concept of comprehensive ecologization of public production and other fields of activity, creation of a system of state incentives for resource saving and ecological development, bringing them in line with the sustainable development strategy.

In order to calculate environmental sustainability and anthropogenic load on the territories of united territorial communities, it is suggested to use data on the resources available on a particular territory and to monitor the correlation of these resources and changes that occur with their structure. To fulfil this task, the coefficient of environmental sustainability of land use is calculated on the example of Chernivtsi region.

The calculations made allow stating that 42.3% of the territory of Chernivtsi region is environmentally unsustainable, 52.7% of the region's territory is unstably sustainable, 4.5% is medium-sustainable, there are almost no environmentally sustainable territories. The proposed method can be used to calculate environmental sustainability and anthropogenic load on the territories of the united communities.

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BENCHMARKING AS THE ASSESSMENT METHOD OF EFFICIENCY THE LEBEDYNSKA BREED OF DAIRY COWS

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Abstract

In the classical sense, benchmarking is the most effective way to find hidden production reserves through a comparative analysis of production and economic indicators of farms (agricultural enterprises) in the industry. It allows you to determine your strengths and weaknesses; to identify those methods of work that need to be improved; compare your achievements with competitor performance; improve business processes and product quality, increase efficiency, reduce costs, etc. In this article by the method of benchmarking was determined the economic feasibility of keeping Lebedynska breed of dairy cows, despite the small amount of livestock. The calculations confirmed the economic feasibility of keeping the Lebedynska breed of dairy cows compared with other more common breeds of dairy cows, taking into account biologically-selective features. In the total cost of milk over 50% is the cost of forage. Therefore, to calculate how profitable is the milk production, it is worth to determine how many kilograms of milk we get from 1 kg of dry matter of forage. Among our calculations, the highest conversion rate of dry matter of forage (1.42-1.44) have Holstein, Ukrainian brown and Ukrainian black-pinto breeds, and the smallest has Ukrainian red-pinto breed (1.18). Lebedynska breed has an index of 1.28. It is very clear: increasing productivity will increase the efficiency of forage conversion and farm profitability. But important factor for the efficiency of forage conversion is the improvement of roughage quality. Productivity of cows has a direct dependence on feeding: Holstein breed has 31.9 kg of milk yield per day (fat 3.84%, protein 3.28%); Lebedynska - 25.1 kg per day (fat 3.8%, protein 3.43%). The structure of the cow ration determines the forage costs (the cost of a feed-day). The highest forage costs have the farms where the concentrated feed is dominated by the structure of ration. It`s the farms holding the Holstein breed - 191.7 UAH (by feeding 20.5 kg of grain per day per cow), the smallest - 82 UAH - farms holding the Ukrainian brown (4.3 kg grain per day per cow). In the structure of the diet of Lebedynska breed cows, grains contain 8.5 kg, and the cost of the feed-day is 100.3 UAH.

Key words**:** *benchmarking, economic efficiency, farms, dairy breeds, local breeds*

INTRODUCTION

Current economic conditions make business efficacy to regulate their own activities and to abandon unprofitable assets. Under such conditions, owners of farm animals cease to breed non-competitive breeds. The tendency to crowding out local small breeds of low productivity cows occurs in all countries of the world. So, the Commission on Animal Genetic Resources in Food (FAO) has identified [9] that global animal losses due to genetic erosion are very significant. According to [9], more than 1,500 from 2,600 species of farm animals are endangered or have disappeared, taking out a unique genetic structure. This reduces the population's ability to adapt to environmental changes. The ratification by Ukraine of the 1994 Convention on Biological Diversity [8], the approval in 2007 the Interlaken Declaration and the Global Plan of Action on Genetic Resources of Animals, and the adaptation of the Nogai Protocol on Access to Genetic Resources in 2012, impose certain obligations on Ukraine. One of the main programs is to support the preservation of outstanding local and domestic livestock carrying out the reorganization and ensure harmonious development of genetic diversity and genetic resources conservation of hereditary signs of animals [6].

Currently in Ukraine (at date 01.06.2017 year) on the verge of extinction are Ukrainian Gray (928 cows, 12 bulls), Ukrainian Whitehead (303 cows), Brown Carpathian (133 cows), Lebedynska (970 cows) breeds of dairy cows [3].

The objective of this article is to justify not only the biological importance but also the economic value of small breeds of livestock breeds (choosing Lebedynska breed of dairy cows), which was extracted in the Sumy region (Ukraine) by crossing the disappearing gray Ukrainian breed with Shvitska breed of bulls.

MATERIALS AND METHODS

To achieve the task of bringing the economic efficiency of small domestic breeds of dairy cows, which offer comparative economic analysis, or benchmarking, which is widely used throughout the world as an instrument for economic efficiency. In order to achieve the task of bringing the small-scale domestic breeds of dairy cows to the economic efficiency, apply comparative economic analysis or benchmarking, which is widely used worldwide as a tool for assessing the state of the business and increasing its efficiency, especially in difficult economic conditions. First, it is important to identify the provisions of competitiveness of dairy farms, which keep cows Lebedynska cattle, but milk production compare with the average for the industry and the best farms.

Secondly, benchmarking helps to assess the balance of the cost structure. Comparing their performance with other companies, you can see where the imbalance as a business system [1].

To maximize operating margin, benchmarking involves analysis of operating performance, coupled with the financial. Finally, all this has become an effective tool for operational decision making.

The analysis algorithm should be as follows:

(i) Analyze the annual milk cow's production of selected Lebedynska breed and compare where the research company is located in the rating.

(ii) Determine the cost of milk Lebedynska breed in comparison with other farms that hold other breeds of cows.

(iii) Calculate the operating margin as a result of the ratio of purchasing prices and cost.

(iv) Determine the cost structure of milk at the enterprises that hold cows of Lebedynska breed, compare it with the average indexes

(v) Particular attention in determining the level of costs should be focused on the feeding block, namely, to investigate the level of conversion of dry matter against the background of the cost in the fodder-day [2].

(vi) The key indicator of the efficiency of the diet - the conversion of money (returns through milk in cash to the hryvnia, invested to the ration), which is the main determining factor in calculating the EBITDA. This is exactly what will be the answer to the question of the feasibility of preserving Lebedynska breed of cows in agricultural enterprises.

Thus, the main purpose of such analysis is to identify "bottlenecks" in comparison with other enterprises in the industry and to search for the specific causes of their occurrence and their subsequent elimination. A correct and timely diagnosis provides a platform for the right managerial decisions.

Management accounting methodologies that use farms to calculate financial performance may differ. Therefore, for comparative economic analysis, we follow the worldwide recognized accounting methodology, i.e.:

(a)the fodder grain of own production is calculated at market price, but not at the cost price. Otherwise, the farmer will deceive himself by transferring costs from one pocket to another. He could sell grain at a market price, instead he used it for feeding his own animals;

(b)rearing expenses for the current period include the cost of milk as the main products of the dairy farm, and young animal weight increase is considered as non-monetary income.

(c)compare only operating (production) cost and not take into account depreciation, general production, administrative and financial costs.

It should be emphasized that the task of benchmarking is not to teach a farmer to count money, he is able to do it. The task of benchmarking is to calculate only the operating cost in the same algorithm to be compared.

The analysis is carried out in 4 planes:

• in absolute values (in ths. UAH);
• per 1 fodder cow, UAH;
• per kilogram of milk, UAH;
• share in the structure of cost,%.

To the key indicators of benchmarking we include:

-cost and operating profit in absolute terms for a fodder cow, 100 kg of sold milk and % of margin profit before sale;

-the break-even point and its sensitivity to changes in the value of rations and the purchase price of milk;

-operating profit of the fodder-day for one cow;

-the conversion of the ration to milk in a cash, as an aggregate indicator of the ration`s effectiveness.

We want to draw attention to such indicator as the break-even point and its sensitivity to changes in the value of rations and the purchase price of milk. The sensitivity of the breakeven point largely depends on the level of fixed costs. The higher the fixed costs, the more this business is sensitive to changes of market factors and price pressure.

RESULTS AND DISCUSSIONS

In the process of study were processed the data of enterprises of the Sumy region, which kept cattle breeds of dairy breeds, including few local breeds. It was compared the main economic benefits and economic indicators of the gene pool of the herd of these breeds (Table 1).

Table 1. The main breeding and economic indicators of the growth of dairy cows in 2018

Breed	Ukrainian brown	Ukrainian black-pinto	Ukrainian red-pinto	Simental	Lebedynska	Holstein
Number of cows	389	322	696	711	298	743
Milk yield, kg	7,888.4	7,921.5	9,391.5	10,300.0	7,644.5	9,727
Fat content in milk, %	3.71	3.76	3.77	3.72	3.80	3.84
Protein content in milk, %	3.34	3.29	3.43	3.49	3.43	3.28

Source: own studies and data from the milkua.info information portal.

Grounds on which it is advisable to conduct selection, defined primarily in terms of their importance. In cattle this: yield of milk, the fat content in milk and its quantity. The highest yield of milk was from the Simmental breed of cows by Austrian selection - 10,300 kg, and the smallest - from Lebedynska breed cattle - 7,644.5 kg. The fat content in milk is 3.71-3.84%, and the protein content in milk is 3.28-3.49%. Against this background Lebedynska breed cattle belonging to local had numerous breeds of cows are not significantly different from the best performance of Holstein breed (Fig. 1).

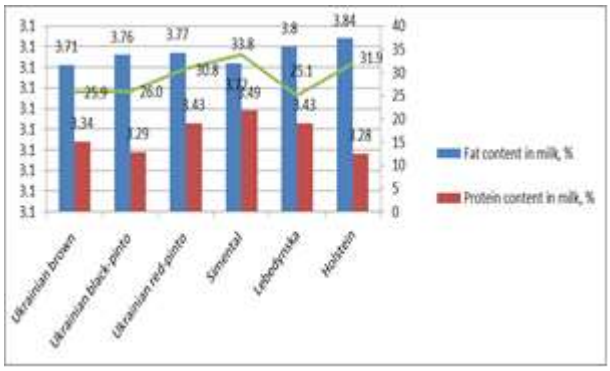

Fig. 1. Diagram of breeding and economic trait of dairy cattle breeds
Source: Own design and calculations.

The production cost of milk by keeping cows of different breeds is significantly different and fluctuates on selected enterprises from 5.18 to 6.29 UAH / kg (full cost will vary within the range of 6.6-7.0 UAH), but the average is 5.65 UAH (Fig. 2).

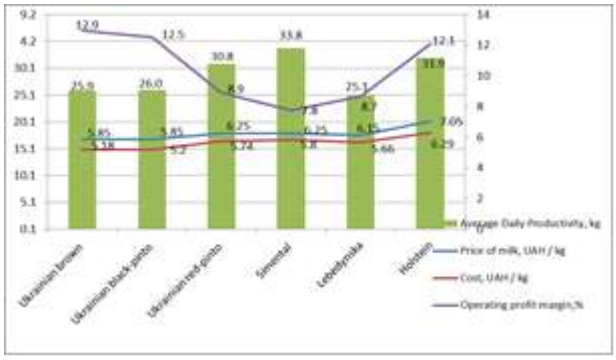

Fig. 2. Diagram of the ratio of animal productivity and operating profit
Source: Own design and calculations.

The analysis of the diagram makes it clear that the farms that holds the Holstein breed

with the highest milk yield has the highest selling price 7.05 UAH / kg, production cost of 6.29 UAH / kg. But at this price of milk the operating margin is not the highest (12.1% compared to 12.9% at the farms holding a Ukrainian brown cow breed).

The investigated Lebedynska breed of dairy cows has average figures - 8.7% margin of operating profit. The lowest operating profit margin has got the farm holding the Simmental breed. Note, that yield of milk per Simmental cow among the investigated farms was the largest (33.8 kg for 305 days).

So, Fig. 2 shows that there is no tight correlation between the level of productivity and operating profit: farms that were in the middle of the performance ranking showed better results in profitability, that is they were more effective.

Consider the main components of the cost of milk production (Fig. 3). According to information that we managed to collect in farms, the average consumption of forage is 65%, 13% - salaries, and 22% - everything else.

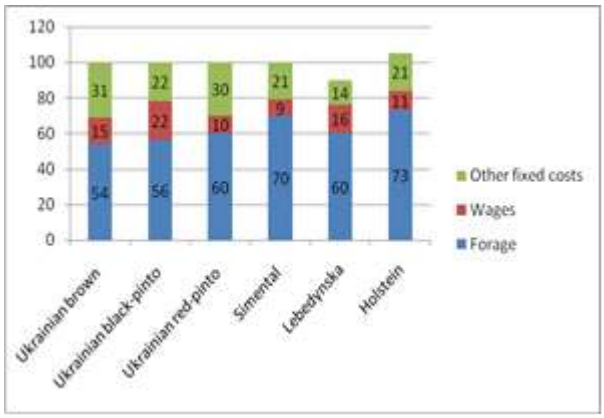

Fig. 3. Structure of the cost of milk production by breed of cows in the investigated farms
Source: Own design and calculations.

The forage is the main cost item (more than half) of milk. In the statistical reporting of agricultural enterprises forage costs account not in natural units, but in money value. This degrades the data, because such indicator reflects not only the technological efficiency of forage, but also the efficiency of their production (a significant portion of forage at agricultural enterprises are by own production) [4, 5].

Forage - a variable flow rate and the factor that directly affects at milk production, the rest - a fixed cost, and they do not depend on the level of production [7].

According to our calculations (Fig. 4), in fixed other expenses about 5% are veterinary drugs, fuel and oils - 4%, artificial insemination - only 1% (but this is the best and cheapest investment that may be on the farm).

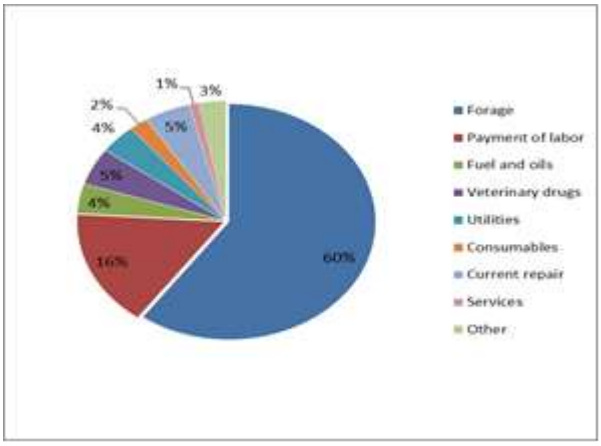

Fig. 4. Cost structure for milk production at the farms holding Lebedynska breed cattle
Source: Own design and calculations.

The main purpose of organizing milk production in a market economy is to make a profit. The unprofitability production of any goods or services in a market economy is bound to go down and even to disappear. If it is not profitable for the manufacturer to produce products each owner will try to get rid of production, which causes him losses.

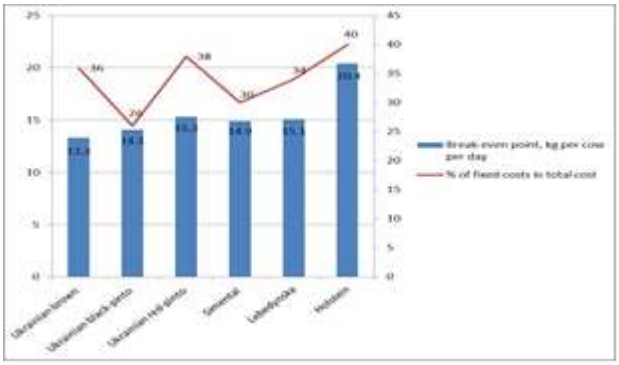

Fig. 5. Break-even point in relative to the level of fixed costs for different breeds of cows
Source: Own design and calculations.

That is why the most important is the question of what is the break-even point: how much should farm milk produce to cover its costs?
Figure 5 by line shows the percentage of fixed costs in the total cost. There is a clear tendency: the higher level of fixed costs, is the higher break-even point.
It was interesting to study the structure of the diet: all rations in Table 2 are reorganized from the smallest proportion of concentrates to the maximum. Note that the rations of Holstein contain more than 50% concentrates, and the conversion of dry matter forage into milk is only 1.24, while the level of protein content in milk is the lowest and the level of cost for veterinary drugs is the highest. But at the same time average daily milk yield is 31.9 kg.

Table 2. Economic evaluation of keeping dairy cows of different breeds according to the intake the diet structure

Breed	Ukrainian brown	Ukrainian black-pinto	Ukrainian red-pinto	Simental	Lebedynska	Holstein
Amount of cows	389	322	696	711	298	743
Milk yield, kg	25.9	26.0	30.8	33.8	25.1	31.9
Fat content in milk, %	3.71	3.76	3.77	3.72	3.80	3.84
Protein content in milk, %	3.34	3.29	3.43	3.49	3.43	3.28
The consumption of feed per cow, kg, including						
Roughage	27.4	27.2	28.7	34.6	29.3	22.2
Protein Group	3.5	3.7	2.1	3.5	3.3	3.9
Grain fourage and others	4.3	5.5	8.7	9.9	8.5	20.5
Conversion of dry matter, kg	1.42	1.43	1.18	1.19	1.28	1.44
Cost of ingredients of the ration, UAH per kg						
Roughage	1.97	2.11	1.97	2.14	1.67	1.85
Protein Group	0.97	0.93	1.17	0.99	1.16	0.93
Grain fourage and others	5.72	7.15	4.59	7.7	5.6	7.17
The cost of feed-day per cow, UAH	82.0	100.2	98.9	153.7	100.3	191.7
Fourage conversion, UAH per kg	2.72	2.74	2.69	2.27	2.26	2.24
EBIDA, %	24.4	25.2	22.2	26.8	22.3	32.6

Source: own research.

The money value of the fodder-day depends on the quality of the roughage. There is a clear trend: an increase in prices a kilogram of cow`s ration (variable cost) increases the total cost of milk production. Therefore, special attention now should be paid to their best harvesting their own quality roughage.
The best conversion of forage has the Holstein, Ukrainian brown and Ukrainian black-pinto breeds, because the quality of coarse feed is high, which makes it possible from this source to maximally satisfy the needs of cows in nutrients. Lebedynska breed in all indicators occupies median positions.
Conducted analysis of variance possible to determine the influence of factors - yield per lactation (A) and the cost of feed daily (B) on indicators of overall economic efficiency of keeping these breeds of cattle at farms (Table 3).

Table 3. The share of influence factors A and B and their interaction AB on indicators of overall economic efficiency of keeping these breeds of cattle at farms

	Factor	Ukrainian brown	Ukrainian black-pinto	Ukrainian red-pinto	Simental	Lebedynska	Holstein
Profit of feed-day, UAH per day	A	19.5	14.2	7.7	5.2	18.9	9.5
	B	36.4	40.6	44.1	54.3	41.8	59.2
	AB	44.1	45.2	48.2	40.5	39.3	31.3
EBIDA, %	A	21.3	19.4	23.5	20.6	22.1	11.6
	B	14.4	14.3	7.9	20.0	12.4	8.5
	AB	64.3	66.3	68.6	59.4	65.5	79.9

Source: own research.

Thus, the calculated EBIDA showed that keeping cows of Lebedynsk breed is economically feasible. Taking into account indicators of biological value, farm receives 22% of the profit from each unit of the Ukrainian currency (“hryvnya”, UAH) of milk revenue. This indicator is the average for dairy cattle breeding in Ukraine.

CONCLUSIONS

Organizing production, should think twice about the technological aspects, on which depends the result. In order to evaluate the total efficiency of the farm, experts use the following key indicators:
-In the total cost of milk over 50% is the cost of forage. Therefore, to calculate how

profitable is the milk production, it is worth to determine how many kilograms of milk we get from 1 kg of dry matter of forage. Among our calculations, the highest conversion rate of dry matter of forage (1.42-1.44) have Holstein, Ukrainian brown and Ukrainian black-pinto breeds, and the smallest has Ukrainian red-pinto breed (1.18). Lebedynska breed has an index of 1.28. It is very clear: increasing productivity will increase the efficiency of forage conversion and farm profitability. But important factor for the efficiency of forage conversion is the improvement of roughage quality.

Productivity of cows has a direct dependence on feeding: Holstein breed has 31.9 kg of milk yield per day (fat 3.84%, protein 3.28%); Lebedynska - 25.1 kg per day (fat 3.8%, protein 3.43%).

The structure of the cow ration determines the forage costs (the cost of a feed-day). The highest forage costs have the farms where the concentrated feed is dominated by the structure of ration. It`s the farms holding the Holstein breed - 191.7 UAH (by feeding 20.5 kg of grain per day per cow), the smallest - 82 UAH - farms holding the Ukrainian brown (4.3 kg grain per day per cow). In the structure of the diet of Lebedynska breed cows, grains contain 8.5 kg, and the cost of the feed-day is 100.3 UAH.

That is, the keeping of the Swan breed of dairy cows, taking into account biologically-selective features, is economically feasible in modern conditions of management.

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CORRELATION BETWEEN STUDENTS DIET TOWARDS GASTRITIS IN FACULTY OF AGRICULTURAL INDUSTRIAL TECHNOLOGY OF PADJADJARAN UNIVERSITY

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Abstract

Gastritis or in Indonesian known as "maag" is a disease that disrupts activity and if not handled properly it could be fatal. The dietary habit that consists of the frequency of eating, the portion of food and the type of food that is not good greatly affects the occurrence of gastritis, occasionally these conditions cause injury to the stomach wall. The aims of this research was to discover the correlation between students dietary habit towards gastritis in faculty of agricultural industrial technology of Padjadjaran University. Data collection used is a questionnaire adjusted to the aim of this research and refers to the concepts and theories have been made. Data analysis used is a statistical test through univariate analysis and bivariate analysis. Univariate analysis which carried out is characteristics of respondents through age, gender, diet that consists of the frequency of eating, food portions, type of food and the occurrence of gastritis. In addition, bivariate analysis was carried out regarding the correlation between the characteristic of students diet (age, gender, frequency of eating, food portions and type of foods) towards gastritis. In the Agricultural Industrial Technology Faculty of Padjadjaran University, students who suffer gastritis as much as 70%. And 17-20 years old students who suffer gastritis as much as 77%. Female students who suffer gastritis is 65%, the students with less eating frequency is 56%, the students who like a type or variety of food is 63%, and the students with less of food portion is 63%. There was a significant correlation between age, gender, eat frequency, food portion and food types towards gastritis to students at Agricultural Industrial Technology Faculty of Padjadjaran University.

Key words**:** *gastritis, diet, food portions*

INTRODUCTION

World Health Organization (WHO) conducted a review of several countries and the results of the percentage of occurrence gastritis in England 22%, China 31%, Japan 14.5%, Canada 35% and French 29.5%. In the world, gastritis affects 1.8–2.1 million of the population each year. The occurrences of gastritis in Southeast Asia is approximately 583,635 of the population each year. The prevalence of endoscopic confirmed gastritis in population at Shanghai is approximately 17.2% which is substantially higher than the population in the west which approximately 4.1% and is asymptomatic. Gastritis is usually considered as a little thing, but gastritis is the beginning of a disease that could cause a trouble.

According to WHO in 2009, the percentage of occurrence gastritis in Indonesia as much as 40.8%. The incidence of gastritis in several regions in Indonesia is quite high with prevalence of 274,396 cases from 238,452,952 residents. The percentage of occurrence gastritis in Surabaya as much as 31.2%, Denpasar 46%, while in Medan it reaches 91.6%. Based on Indonesian Health profile in 2009, gastritis is one of the 10 most common diseases suffered by inpatients at the hospitals in Indonesia with 30,154 cases (4.9%). Based on data from the West Sumatera Provincial Health Office, Gastritis ranks 3rd out of the 10 most diseases in West Sumatera in 2009 which is 202,577 cases (11.18%).

Gastritis or in Indonesian known as "maag" is a disease that disrupts activity and if not handled properly it could be fatal. Usually gastritis occurs in human who have irregular diet and eat foods that stimulate stomach acid

production. Some infections of microorganism can also cause gastritis. The indications of gastritis are pain in the pit of stomach, nausea, vomiting weak bloating and crowded, decreased appetite, pale, fever, headache and always belch, and in the worst condition could vomit blood [15]. The causes of gastritis are distinguished by internal factors which is the presence of conditions that stimulate excessive stomach acid release, and external substances that cause irritation and infection. Some risk of gastritis are using aspirin or non-steroidal anti-inflammatory, helicobacter pylori infection, alcoholism, smoker, stress, irregular eating habits and lots of spicy and sour foods [19].

Gastritis usually begins with an irregular diet that make the stomach become sensitive if the stomach acid increases. Diet is an information that provides an overview of the types and models of food consumed every day, diet consists of the frequency of eating, food portions and food types. A balanced menu needs to be started and known so that balanced eating habits are formed. A good and regular diet is one of the management and preventive action of gastritis. Healing of gastritis requires food regulation as an effort to improve digestive tract. Diet or food consumption are the types and quantities of food consumed by a person or group at a certain time [17] [9].

The impact of gastritis is very disturbing the nutritional condition or nutritional status. Nutritional condition consists of malnutrition, good/normal or over nutrition. Lack of one nutrient could cause a disease in the form of a deficiency disease. Deficiencies in marginal limits cause a light disturbance or decreased functional ability [21]. For example, deficiency of vitamin B1 can cause the body get tired quickly, while in human iron deficiency can reduce work and learning performances, in addition to decreasing the body's resistance to infection so it is easy to get disease.

The researchers chose the Agricultural Industry Technology Faculty students of Unpad because they found that during college the students generally had unhealthy lifestyles such as lack of attention to food consumed both diet and food types. Providing a variety of foods is very influential, because that can cause boredom, reducing appetite and prefer fast food. So the researchers were interested in conducting a study on "Correlation between Students Diet towards Gastritis in Faculty of Agricultural Industrial Technology of Padjadjaran University".

Based on a preliminary study of several students who often eat late, like spicy food, and consume food carelessly. Unattractive presentation of foods, such as the taste and type of food that is not good, causes the students prefer fast food. The diet that consists of the frequency of eating, food portion and food type that is not good can affect the occurrence of gastritis, occasionally these conditions cause injury to the stomach wall.

Based on these data, the researchers were interested in researching about "Is there a correlation between students diet towards gastritis in Faculty of Agricultural Industrial Technology of Padjadjaran University?".

MATERIALS AND METHODS

This research was designed to direct the controls factors that might affect the validity of the research. The methodology of this research is a quantitative using Cross Sectional design. In this study, all variables observed, measured at the same time. This research used primary data to determine the correlation between students diet and gastritis in Agricultural Industrial Technology Faculty of Unpad. The independent variable is diet and the dependent variable is the occurrence of gastritis will be collected at the same time. The advantage of this Cross Sectional method is the easiness, simple, economical in terms of time and the results can be obtained quickly. This research was conducted through distributing the questionnaires to Students.

The researcher used the student population of the Faculty of Agricultural Industrial Technology Unpad with the following inclusion criteria: 1. Students of the Faculty of Agricultural Industrial Technology Unpad. 2.

Willing to be a respondent. The time of this research is held from May 18 to May 21, 2017.

Data collection used is a questionnaire adjusted to the aim of this research and refers to the concepts and theories have been made. The instrument for data collection consists of 3 parts: 1.Demographic data (Identity includes the date of filling, initial name, age and gender). 2.Diet questionnaire (second part questionnaire to find out the frequency of eating habits, types of food, and portion of food. To measure the frequency of meals that will be filled by respondents with answers Yes or No). 3.Gastritis questionnaire (third part of questionnaire to determine the occurrence of gastritis).

Data analysis used is a statistical test through univariate analysis and bivariate analysis. Data analysis with univariate was carried out on each variable of the research results, and bivariate analysis was performed on two variables that were allegedly related.

Univariate analysis, the variables in this research were arranged descriptively with a diet distribution table. The diet distribution table contains the characteristics of the respondents including age, gender and diet.

Bivariate analysis is to know the correlation between independent variables and dependent variables using the Chi Square statistical test with a significance level of P≤0.05 and 95% of confidence interval (CI). There are several stages in bivariate analysis :

a. Establishing a hypothesis, hypothesis is a statement that needs to be tested for truth. The hypothesis used in this research is the alternative hypothesis (Ha) because the researcher has a temporary answer from the research results, which has a correlation between the characteristics of students on diet with gastritis. The statistical test directions used in this research are two tail because they only state differences/correlations in students diet with gastritis without looking at whether the dietary characteristic variables are higher/lower than gastritis.

b. Determination of appropriate statistical tests. This research aims to determine the correlation of diet with gastritis in students so that the Chi-Square test is used. This is because the research uses two categorical variables including diet and gastritis in students.

c.Determining the level of boundary significance/level of significance, often called the α value, in this research the value of α is 5%.

d.Statistical test. This stage is to calculate sample data into the appropriate hypothesis test. This research was aware of whether there was a correlation between diet and gastritis in students, the measurement data was entered into the Chi-Square test formula. The Chi-Square testing process is comparing the frequency that occurs (observation) with the frequency of expectations. If the frequency of observation with the expected frequency value is the same, then there is no significant correlation, otherwise if it is not the same, then there is a significant correlation.

e. Statistical test decisions. The results of statistical tests produce two possible decisions, namely rejecting the null hypothesis (Ho) and failing to reject the null hypothesis (Ho). The researcher looks for p (value) in the statistical test. The p value is used to make a statistical test decision by comparing the p value with α (alpha). This research uses α 5% so that if the value of p > α is obtained, the results of statistical calculations are not significant, meaning that there is no correlation between the characteristics of diet and gastritis in FTIP students. Conversely, if p≤α is obtained, the results become significant, meaning that there is a significant correlation between diet and gastritis in FTIP students.

So this research resulted in the existence of several variables which showed a significant correlation including the variables of age, gender, type of food, and diet with gastritis. And there are several variables that show no significant correlation, namely the frequency and portion of eating with gastritis.

RESULTS AND DISCUSSIONS

Univariate Analysis

Univariate analysis aims to describe systematically, actual or specific facts or

characteristics of a particular population or field consisting of respondent's age, respondent's gender, diet and gastritis incidence. The total number of samples consisting of several study programs at the Faculty of Agricultural Industrial Technology Unpad was 100 respondents and there were no missing data on respondent's age, respondent's gender, diet (frequency of eating, type or variety of foods, food portions) and the incidence of gastritis.

a. Age

The description of the age distribution of the respondents can be seen in Table 1.

Table 1. Frequency Distribution of Respondents Based on Age

Age	Frequency	
	Number (n)	Percentage (%)
17-20	77	77%
21-25	23	23%
Total	100	100%

Source: processed data.

Based on Table 1, it was found that out of 100 respondents studied, the number of respondents aged 17-20 years was 77 respondents (77%) and respondents aged 21-25 years were 23 respondents (23%). So the majority of respondent's age is 17-20 years old compared to 21-25 years old.

Age is one of the risk factors for gastritis, especially in students or in the transition from being dependent on parents to periods of responsibility and the obligation to be able to stand alone. According to [20], dietary problems in students who are able to trigger gastritis are caused by several factors, including the habit of not having breakfast and usually girls are often stuck with an unhealthy diet, wanting a drastic weight loss to disrupt their diet. This because students have a body image that refers to their idols who are usually artists, models, celebrities who tend to have thin, tall, and slender bodies. Fast food eating habits also affect the occurrence of gastritis in which the nutritional composition is not balanced, which is too high in energy content, such as pasta, fried chicken, and usually consume excessive carbonated drinks and snacking habits that are low in nutrition (lack of calories, protein, vitamins and minerals) such as snacks, crackers, chips etc [5].

b. Gender

The description of gender frequency distribution in respondents can be seen in Table 2.

Table 2. Frequency Distribution of Respondents Based on Gender

Gender	Frequency	
	Number (n)	Percentage (%)
Male	35	35%
Female	65	65%
Total	100	100%

Source: processed data.

Based on Table 2, it was found that out of 100 respondents studied, the number of male respondents was 35 respondents (35%) and female respondents was 65 respondents (65%).

Gender is an internal factor that determines nutritional needs, so there is a correlation between gender and the occurrence of gastritis [1]. Gender determines the size of nutritional needs for a person. Individual growth and development are very different between men and women.

According to [3], a wrong diet can affect other nutritional problems that occur in a lot students, especially women who lack iron or anemia. Anemia is a continuation of the effects of lack of macro nutrients (carbohydrates, proteins and fats) and lack of micro nutrients (vitamins, minerals). The prevalence of anemia in teenage-young adults in Indonesia is still quite high. Based on the national survey in 2000, the prevalence of anemia in adolescent girls was 57.1% while in adolescent boys it was 42.9%.

c. Eating Frequency

Table 3. Frequency Distribution of Respondents Based on Eating Frequency

Eating Frequency	Frekuensi	
	Number (n)	Percentage (%)
3 times a day (good)	44	44%
<3 times a day (less)	56	56%
Total	100	100%

Source: processed data.

The description of frequency distribution based on eating frequency in respondents can be seen in Table 3. Based on Table 3, it was found that out of the 100 respondents studied, the number of respondents who had a good frequency of eating was 44 respondents (44%) and respondents who had less frequency of eating were 56 respondents (56%). So the majority of respondents eat frequency is more the frequency of eating less than the frequency of eating well.

The results show that most students are at risk of gastritis. This is because more students have a frequency of eating less and have a habit of "snacking" that is low in nutrition. The purpose of eating frequency is the main meal frequency, which is 3 main meals every day, namely breakfast, lunch and dinner. The frequency of eating is a very important domain for gastritis [6] [10].

According to [12], the frequency of eating is good if the frequency of eating every day is 3 times the main meal or 2 times the main food with 1 meal interlude, and is considered less if the frequency of eating every day 2 main meals or less so at risk for gastritis.

According to [7], naturally the stomach will continue to produce stomach acid every time in small amounts in 4-6 hours after eating, usually glucose levels in the blood have been absorbed and used a lot until the body will feel hungry and the amount of stomach acid stimulated in at that time. If someone is eating late for 2-3 hours, the stomach acid produced is more and more excessive so that it can irritate the gastric mucosa and cause pain around the epigastrium.

d. Type of food

Table 4. Frequency Distribution of Respondents Based on Type or Variety of Food

Type or Variety of Food	Frequency	
	Number (n)	Percentage (%)
Not sour and not spicy (not irritating)	37	37%
acidic and spicy (irritating)	63	63%
Total	100	100%

Source: processed data.

The description of the frequency distribution of food types respondents can be seen in Table 4.

Based on Table 4, it was found that out of the 100 respondents studied, the number of respondents who did not irritate food were 37 respondents (37%) and respondents who had irritating food types were 63 respondents (63%). So it can be concluded that in the Faculty of Agricultural Industrial Technology Unpad, most students like irritating foods.

[4] state that foods that are not careful such as spicy foods and acids will stimulate the stomach wall to release stomach acid, ultimately the strength of the stomach wall decreases, occasionally such conditions cause injury to the stomach wall which causes gastritis.

e. Food portion

The description of the frequency distribution of food portions to respondents can be seen in Table 5.

Based on Table 5, it was found that out of the 100 respondents studied, the number of respondents with less food portions was 63 respondents (63%) and respondents with good food portions were 37 respondents (37%). So it can be concluded that most respondents had less of food portions.

Table 5. Frequency Distribution of Respondents Based on Food Portions

Food Portion	Frequency	
	Number (n)	Percentage (%)
Less than 300-500 grams (<3-5 rice dishes / day)	63	63%
300-500 grams (<3-5 rice dishes / day)	37	37%
Total	100	100%

Source: processed data.

According to the [5], the portion of food consumed every day must follow the general guidelines for balanced nutrition, namely dishes composed of staple foods (3-5 servings/day), side dishes (2-3 servings/day), vegetables (2-3 servings/day), and fruit (3-5 servings/day), while the food portion of respondents, the types of food eaten every day have not followed the general guidelines for balanced nutrition, so many students are at risk of gastritis.

f. Gastritis

The description of the frequency distribution of gastritis in respondents can be seen in Table 6.

Table 6. Frequency Distribution of Respondents Based on Occurrence of Gastritis

Gasrtitis	Frequency	
	Number (n)	Percentage (%)
Occur	70	70%
Did Not Occur	30	30%
Total	100	100%

Source: processed data.

Based on Table 6, it can be seen that of the 100 respondents studied, the number of respondents who had gastritis were 70 respondents (70%) and respondents who had no gastritis were 30 respondents (30%). The majority of respondents have more gastritis compared to no gastritis. So it can be concluded that most of respondents have gastritis. This is due to students who often eat late and like to eat sour and spicy foods, in addition to the irregular student diet that is easily attacked by gastritis.

2. Bivariate Analysis

a. Correlation of Age with Gastritis

To find out the correlation between age and gastritis in the respondents used the chi-square test. The results of the analysis are presented in Table 7.

Table 7. Correlation Between Age and Gastritis in Respondents

Age	Gastritis				Total		OR 95% CI	P Value
	Suffered		Not Suffered					
	N	%	N	%	N	%		
17-20	50	65%	27	35%	77	100%	0.2778 (0.07-1.019)	0.0431
21-25	20	87%	3	13%	23	100%		
Total	70	70%	30	30%	100	100%		

Source: processed data.

The results showed a correlation of age with gastritis was 77 respondents at the age of 17-20 years, there were 50 respondents (65%) had gastritis and 27 respondents (35%) who did not have gastritis, while from 23 respondents aged 21-25 years there were 20 respondents (87%) had gastritis and 3 respondents (13%) did not have gastritis. The results of statistical tests found a significant correlation between age and gastritis, obtained P value = 0.0431. Odd ratio test shows that the age of respondents 17-20 years has a chance of 0.2778 times gastritis than the age of respondents 21-25 years.

[9] found that age has a significant correlation with gastritis According to [14] Adolescence is a period of seeking self-identity, the desire to be accepted by peers and being attracted by the opposite gender causes them to maintain their appearance. All of that affects their diet, including the selection of food ingredients and the frequency of eating. They are afraid to feel fat until they avoid breakfast and lunch or only eat once a day, which causes gastritis.

According to [18] the incidence of anorexia and bulimia has increased over the past decade. About 1 in 100 girls between the ages of 16 and 18 suffer from anorexia. The peak incidence of anorexia occurs at the age of 17 years, and female adolescents experience more eating disorders compared to adolescent boys with a ratio of 10:1. The disorder is generated by fear that the body will get fat after eating and this mental fear will emanate through physical torture. That research and theory can be concluded that age can affect the occurrence of gastritis, especially on diet. Teenagers-young adult have a greater impact on the occurrence of gastritis. The study is in line with this research, that there is a significant correlation between age and gastritis, because the majority of students being included in adolescence, namely the period of seeking self-identity and students getting interested in the opposite gender causing students very guarding their appearance and stuck to the wrong diet. This is in accordance with the theory of [14], which states that nutritional problems that

arise in adolescence are triggered by mis-understanding about nutrition, which they often have an understanding that the body becomes a dream is the body slim, so to maintain their slowness they make wrong diet and they are easily attracted to new things, including advertised food products, even though these foods do not necessarily have good nutritional content.

b. Correlation of Gender with Gastritis

To find out the correlation between gender and gastritis in respondents used the Chi-Square test. The results of the analysis are presented in Table 8.

Table 8. Correlation of Gender with Gastritis in Respondents

Gender	Gastritis				Total		OR 95% CI	P Value
	Suffered		Not Suffered					
	N	%	N	%	N	%		
Male	16	46%	19	54%	35	100%		
Female	49	75%	16	25%	65	100%	0.275 (0.115-0.657)	0.003
Total	65	70%	35	30%	100	100%		

Source: processed data.

The results showed that from 35 male respondents there were 16 respondents (46%) who had gastritis and 19 respondents (54%) who did not have gastritis. While from 65 female respondents there were 49 respondents (75%) had gastritis and 16 respondents (25%) did not have gastritis. Statistical tests showed that there was a significant correlation between gender and gastritis, obtained P value = 0.003. For the Odd Ratio test showed that female had a chance of 0.275 times a gastritis than male.

The results of [11] study which states that there is a significant correlation between gender and gastritis. This result can be interpreted that there are differences in diet with gender between female and male which can lead to gastritis. In this research also found that female experience more gastritis than male. The study is in line with this research, that there is a correlation between gender and gastritis, it can be because the majority of students have poor diet and students have different tendencies in each gender on their diet. Besides that, it can be assumed that female students pay more attention to their body posture than male students, this is in accordance with [13] which states that female are more concerned with their appearance than male, so they more at risk of gastritis. Whereas according to the [14] that nutritional needs between male and female are different, especially in adolescence.

Table 9. Correlation of Frequency of Eating With Gastritis in Respondents

Frequency of Eating	Gastritis				Total		OR 95% CI	P Value
	Suffered		Not Suffered					
	N	%	N	%	N	%		
Good	26	59%	18	41%	44	100%		
Poor	44	78%	12	22%	56	100%	0.3939 (0.164-0.946)	0.0348
Total	70	70%	30	30%	100	100%		

Source: processed data.

c. Correlation between Frequency of Eating with Gastritis

To find out the correlation between the frequency of eating and gastritis in respondents used the Chi-Square test. These results are presented in Table 9.

The results showed that from 44 respondents at the frequency of eating there were 26 respondents (59%) had gastritis and 18 respondents (41%) had no gastritis. Whereas 56 respondents who ate less frequency there were 44 respondents (78%) had gastritis and 12 respondents (22%) did not have gastritis.

The statistical test results showed that there was a significant correlation between the frequency of eating and gastritis, obtained P value = 0.0348. For the Odd Ratio test, respondents indicated that the frequency of eating <3 times a day had a chance of 0.3939 gastritis times compared to respondents who ate 3 times a day.

It can be concluded that research results are in accordance with [12], which states that respondents who have a frequency of eating <3 times a day can cause gastritis compared to respondents who have a frequency of eating 3 times a day. While the purpose of eating frequency is the main frequency of eating, which is 3 main meals every day, namely breakfast, lunch and dinner. Naturally, food is processed in the body through digestive devices starting from the mouth to the small intestine [8]. Duration of food in the stomach depends on the nature and type of food. If on average, generally the stomach is empty between 3-4 hours. The frequency of eating <3 times a day can cause gastritis, a person will develop gastritis if they are late eating.

The results of [16] study stated that there was no significant correlation between the frequency of eating and gastritis. The results can be interpreted that there is no difference in frequency of eating between 3 times a day with <3 times a day. The study is not in line with this research, that there is a correlation between the frequency of eating and gastritis. Naturally the stomach will continue to produce stomach acid every time in small amounts after 4-6 hours after eating, usually the glucose level in the blood has been absorbed and used so much that the body will feel hungry and at that time stimulated stomach acid. If someone is late to eat 2 to 3 hours, the stomach acid produced is more excessive.

d. Correlation between Food Types and Gastritis

To find out the correlation between type or variety of foods and gastritis in respondents, the Chi-Square test was used. The results of the analysis are presented in Table 10.

Table 10. Correlation between Types or Variety of Foods with Gastritis in Respondents

Types of Food	Gastritis				Total		OR 95% CI	P Value
	Suffered		Not Suffered					
	N	%	N	%	N	%		
Not Iritating	22	59%	15	41%	37	100%		
Iritating	48	76%	15	24%	63	100%	0.4583 (0.19-1.10)	0.0779
Total	70	70%	30	30%	100	100%		

Source: processed data.

The results showed 37 respondents did not like the type or variety of irritating foods, 15 respondents (41%) did not have gastritis and 22 respondents (59%) had gastritis. While 63 respondents liked the type or variety of irritating foods, 48 respondents (76%) had gastritis and 15 respondents (24%) did not have gastritis. The results of the statistical test showed that there was no significant correlation between types of food with gastritis, obtained P value = 0.0779. The odds ratio test showed that respondents eating acidic and spicy foods had a chance of 0.4583 times gastritis than respondents who did not eat sour and spicy.

Types of food that irritate include spicy food, corrosive substances (vinegar and pepper) can cause gastric mucosal damage and cause edema and bleeding, not infrequently these conditions cause injury to the stomach wall. Consuming spicy or acidic foods will stimulate the digestive system, especially the stomach and intestines. This assumption is in accordance with [2], that consuming excessive amounts of spicy and sour foods can result in heat and pain in the pit of the stomach accompanied by nausea and vomiting. These indications make sufferers decrease their appetite. If the habit of consuming spicy and sour foods ≥ 1 x in 1 week, for 6 months left to continue can cause irritation to the stomach called gastritis.

e. Correlation between portion of food and gastritis

To find out the correlation between meal portions and gastritis in respondents, the Chi-

Square test was used. The results of the analysis are presented in Table 11.

Table 11. Correlation between Portions of Food and Gastritis in Respondents

Food Portion	Gastritis				Total		OR 95% CI	P Value
	Suffered		Not Suffered					
	N	%	N	%	N	%		
Good	21	57%	16	43%	37	100%		
Poor	49	78%	14	22%	63	100%	0.375 (0.155-0.904)	0.0268
Total	70	70%	30	30%	100	100%		

Source: processed data.

The results showed that from 37 respondents with a good portion of food there were 21 respondents (57%) had gastritis and 16 respondents (43%) who did not have gastritis. Whereas 63 respondents with less food portion there were 49 respondents (78%) had gastritis and 14 respondents (22%) did not have gastritis. The statistical test showed that there was a significant correlation between the portion of food and gastritis, obtained P value = 0.0268. The odds ratio test showed the portion of food less than 300-500gr has a chance of 0.375 times gastritis than the portion of food of 300-500gr.

The results of [16] study stated that there was no significant relationship between the portion of food and gastritis. The study was in line with this research, that there is no relationship between eating portions with gastritis. If someone is late to eat 2 to 3 hours, the stomach acid produced is more excessive. However, although the food portion is <300-500 grams, if it is mixed with consuming snacks, stomach acid will remain controlled.

CONCLUSIONS

Based on the results and discussion, researchers can conclude as follows:

(i)Students of the Faculty of Agricultural Industrial Technology Unpad have more gastritis with a percentage of 70% compared to students who do not have gastritis.

(ii)Students of the Faculty of Agriculture Industrial Technology Unpad aged 17-20 years have more gastritis with a percentage of 77% compared to students aged 21-25 years.

(iii)Female students of the Faculty of Agriculture Industrial Technology Unpad have more gastritis with a percentage of 65% compared to male students.

(iv)Students of the Faculty of Agricultural Industrial Technology Unpad have more of 'less eating frequency' with a percentage of 56% compared to students with a good frequency of eating.

(v)Students of the Faculty of Agricultural Industrial Technology Unpad who like the type or variety of irritating foods more with a percentage of 63% compared to students who do not like the type or variety of foods not irritating.

(vi)Students of the Faculty of Agricultural Industrial Technology Unpad have more of 'less food portion' with a percentage of 63% compared to students with good food portions.

(vii)There is a significant correlation between age and gastritis in students at the Faculty of Agricultural Industrial Technology Unpad.

(viii)There is a significant correlation between gender and gastritis in students at the Faculty of Agricultural Industrial Technology Unpad.

(ix)There is a significant correlation between the frequency of eating and gastritis in students at the Faculty of Agricultural Industrial Technology Unpad.

(x)There is no significant correlation between types of foods and gastritis in students at the Faculty of Agricultural Industrial Technology Unpad.

(xi)There is a significant correlation between the portion of food and gastritis in students at the Faculty of Agricultural Industrial Technology Unpad.

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THE ROLE OF SUBAK AS CULTURE CAPITAL TO DEVELOP COMMUNITY BASED TOURISM VILLAGE (CASE STUDY IN PINGE VILLAGE, BALI PROVINCE, INDONESIA)

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Abstract

Indonesia Tourism Development Corporation (ITDC) and the Provincial Government of Bali developing programs community-based tourism(Community Based Ecotourism). One of them is Pinge Village, located in Tabanan Regency of Bali Province, Indonesia. Pinge Village is an old village that has a unique form of traditional house and geographical potential as an agricultural area. Supported by the subak organization that implements the value of local wisdom with the concept of Tri Hita Karana, Pinge Village is very suitable to be developed as a tourism village whose tourism patterns help the local economy but still preserve the environment, and social culture of the local community. This study aims to develop a baseline study of the potential of subak organizations and potential tourism objects in supporting Pinge Village as a sustainable tourism village, as well as to implement and evaluate cooperation models and policies that can be built by local governments and stakeholders related. The type of data that will be used is perceptual data and existing data which are then analyzed by SWOT analysis. The results showed that Pinge Village supported by subak had tourist facilities and attractions involving tourists, as well as the potential of performing arts so that Pinge Village could be developed as a sustainable tourism village. The strategy implemented is to support aggressive growth policies through increasing the role and capacity of the community as the main actors in the development of Tourism Village and supported by the availability of infrastructure, strengthening community institutions and cooperation between stakeholders.

Key words**:** *Community Based Tourism (CBT), tourism village, subak, culture capital*

INTRODUCTION

Tourism is one sector that makes an important contribution to regional economic growth. This is supported by the availability of natural resources and socio-cultural communities that have unique local characteristics that become tourist destinations for domestic and foreign tourists. In line with the increasingly rapid dynamics of the tourism sector, one of tourism development is a tourism village, which is aimed at sustainable rural development. The concept of tourist villages reflects the characteristics of rural uniqueness with the potential of natural resources and socio-economic conditions and cultural communities. Community-based tourism village emphasizing the community's active role in managing tourism activities in the area owned by custom (Ministry of Culture and Tourism and WWF-Indonesia, 2009) [3].

In tourism, Eadington & Smith (1992) interpret sustainability as a form of tourism that is consistent with natural, social, and community values and which allows both hosts and guests to enjoy the positive and worthwhile interaction and shared experiences. In order for sustainable development to be guaranteed, there are three main pillars (triple bottom line) that must get attention, namely: (1) Environmental/ ecological sustainability; (2) Socio-cultural sustainability; and (3) Economic sustainability, not only for the current generation, but also for future generations (Bali Sustainable Development Project, 1993; WTO, 1993).

One of the villages in Bali Province which were developed into a tourism village is Pinge Village, located in Marga District, Tabanan

Regency, 17 km in the northern of Tabanan City, the distance to Pinge Tourism Village from Denpasar city is approximately 34 km. Pinge Tourism Village is an old village that is one of the tourist attractions in Bali. This village has its own uniqueness, which is the form of traditional houses, called *Angkul-angkul*, which are parallel and neatly arranged. This village also has a very natural panorama. Tourists visiting this village can see directly the farmers plowing fields, preparing seeds, planting rice, reaping and putting rice in the barn. In addition to the natural potential and forms of traditional Balinese buildings, tourists can also see ancient relics found in *Natar Jemeng Temple*.

The majority of Pinge villagers as farmers. Terracing rice fields and agricultural culture, with traditional irrigation systems, called *subak*. In this *subak*, the Pinge villagers, especially the subak member farmers, have implemented the *Tri Hita Karana* concept well. The concept *Tri Hita Karana*, namely *Parahyangan* in the *subak* system is indicated by the presence of temples in the *subak* region and in the farmers' rice fields. The concept of *Palemahan* is indicated by the ownership of rice fields for each *subak*. The concept of *Pawongan* demonstrated by the existence of farmer organizations that are tailored to local needs, the presence of *subak* members, *subak* administrators, and *subak* leaders. In 2012 UNESCO (United Nations Agency for Education and Culture) [17] recognized *subak*, Bali Culture Landscape, as a World Heritage Site at the first session held in Saint Petersburg, Russia.

The *subak* organization is one of the values of local wisdom that supports environmental preservation and social values. This is in line with the opinion of some experts (Methieson, 1982; Murphy, 1985; Getz, 1986, Dowling, 2003, in Pitana and Diarta 2009) [9, 6, 4, 11] emphasizing the importance of integration of economic, environmental and social aspects in tourism management. If seen from the function of the *subak* organization as an agricultural system organization, it is one of the local wisdoms. The life of the religious Pinge Village community is able to apply the three aspects of life well so that it can create a noble value agricultural system. Three aspects of the *subak* system are human, environment, and religion that are interconnected so that there is a reciprocal relationship between humans and the environment. The *subak* system is able to maintain the availability of water so that it can provide sufficient water for all rice fields.

Related culture could to this, Windia & Wiguna (2012) [19] stated that *subak* as one of the cores of Balinese be developed as an attraction of tourism in gaining foreign exchange for the region and the people of Bali. But it needs to be considered, so that the role of *subak* in attracting tourists can also be enjoyed by farmers as the main actors in the preservation of the *subak* system, so that there is a harmonious relationship between the development of the tourism sector with the preservation of the *subak* system as one of Balinese culture. This is in line with Wiguna & Surata (2008) [18], which states that *subak* has a considerable opportunity in generating foreign exchange and increasing people's income, through the development of agriculture-based tourism. Looking at the importance of the *subak* function, it is interesting to study the Role of *Subak* as Culture Capital in the Development of Pinge Village as a Sustainable Tourism Village.

The objectives of this study are: (1) Developing a baseline study of the potential of *subak* organizations in supporting Pinge Village as a sustainable tourism village; (2) Develop a baseline study of potential tourism objects in Pinge Village which can be developed in addition to *subak*; and (3) Implementing and evaluating cooperation models and policies that can be built by local governments and stakeholders related.

MATERIALS AND METHODS

The Concept of Tourism Village

The village is a rural area that has a unique potential and unique tourist attraction both from socio-economic life, socio-cultural, unique customs, village spatial structures which are all managed in an interesting and natural way with the development of tourism

support facilities. Tourism village is a form of integration between attractions, accommodation and supporting facilities that are presented in a structure of community life that is integrated with prevailing procedures and traditions (Nuryanti, 1993 in Budhi & Lestari, 2016)) [10, 1].

The concept of developing a tourist village contains the following principles (Ministry of Culture and Tourism and WWF-Indonesia, 2009) [3].

(i)Not contrary to the customs or culture of the community. A village whose procedures and customs still dominate the pattern of community life, in its development as a tourist attraction must be adjusted to the procedures that apply in the village.

(ii)Physical development to improve the quality of the village environment. Tourism development in a village does not change what is already in the village and package it in such a way that it is interesting to be a tourist attraction.

(iii)Paying attention to elements of locality and authenticity. The landscape pattern used in development must display the characteristics of the village.

(iv)Empower rural tourism communities in every aspect of tourism. The community is directly involved in tourism activities in the form of providing services and services whose results can increase people's income beyond their daily activities.

(v)Paying attention to the carrying capacity and environmental insight. Development that exceeds carrying capacity will have a large impact not only on the natural environment but also on the socio-cultural life of the community.

(vi)Tourism village development is part of the implementation of tourism that is directly related to services, which require cooperation with various components of tourism organizers, namely the government, the private sector, and the community.

Community Based Tourism Village

The village can be interpreted as a trip by a tourist to a remote area with the aim of enjoying and learning about nature, history, and culture in an area, where tourism patterns help the economy of local communities and support nature conservation. Fandeli (2005) [5] mentions Tourism Village as a blend of growing interests from economic and social environmental concerns. Tourism Village is a concept of tourism development that is responsible for environmental sustainability, provides economic benefits and maintains the cultural integrity of the local community (Lestari & Budhi, 2015; Lestari et al., 2018) [7, 8]. Tourism Village is a form of travel to natural areas that is carried out for environmental conservation and preserving, prospering the local population (The Ecotourism Society, 1990) [16].

***Subak* as Culture Capital**

The Balinese farming system with its local wisdom, namely *subak*, is very distinctive compared to other regions. As expressed by Pitana (1997) [12]. described that *subak* in Bali has five characteristics, namely: (a) *Subak* is a farmer organization managing irrigation water for its members. As an organization, *subak* has management and organizational arrangements *(awig-awig)* written and unwritten; (b) *Subak* have shared water sources, in the form of dams *(ampelan)* in rivers, springs, or the main channel of an irrigation system; (c) *Subak* have a rice field area; (d) *Subak* has autonomy, both internal and external; and (e) *Subak* have one or more Bedugul temples related to breeding.

Subak is essentially a commensurate technology because its nature is in accordance with the principles of technology commensurate as proposed by Mangunwijaya (1985) in Windia and Wiguna (2012) [19], namely: (i) its activities are based on self-help businesses and are not dependent on experts; (ii) is decentralized; (iii) its activities are based on cooperation, and not on competition; and (iv) is a technology that is aware of social and ecological responsibilities.

In relation to the *subak* as social system to regulate the supply and allocate water (managing irrigation water) on the basis of conformity with the mindset, *subak* builds its organization according to local needs. For example, in certain areas, there is a *subak* management staff called *petilik*, whose duty is

to routinely supervise the allocation and distribution of irrigation water in the area. Because there is only one *subak* in Bali with a variety of inherent value so that it becomes a unique product, so it becomes an attraction of tourists. Since not all regions have *subak* as local wisdom, *subak*, directly and indirectly, becomes the social, economic and cultural culture of Bali. On the other hand, Bali which develops tourism based on culture will go hand in hand with the cultural capital possessed by *subak*, so *subak* is one of the determining factors in the development of sustainable tourism villages.

Review of Previous Research

Research conducted by Budhi, *et al.* (2014) [2] examined the Development of Jatiluwih Village in Tabanan Regency as a Community Based Ecotourism with the results of research that the development of the principle of education in the community and tourists became the most priority part in the development of Jatiluwih Village as a tourism village was followed by a strategy in increasing the carrying capacity of the environment and improving the performance and continuity of community business. This strategy is in line with the principle in the tourism village concept that community involvement in every stage from planning to evaluation becomes very important. And research from Suasih (2016)) [15] examined the Analysis of Determinants of Farmers Determinants (Case Study in *Subak* Pulagan, Tampaksiring Village, Gianyar Regency), which is the results of research is *subak* institutions were able to strengthen various agricultural development programs from the government to realize farmer's welfare.

Research Method

Research was located in Pinge Tourism Village, which is located 500 meters above sea level, is located in Marga District of Tabanan Regency, 17 km in the northern part of Tabanan City. The distance to this Pinge Tourism Village from Denpasar is approximately 34 km and approximately 85 minutes away from Ngurah Rai Airport when using a motorized vehicle.

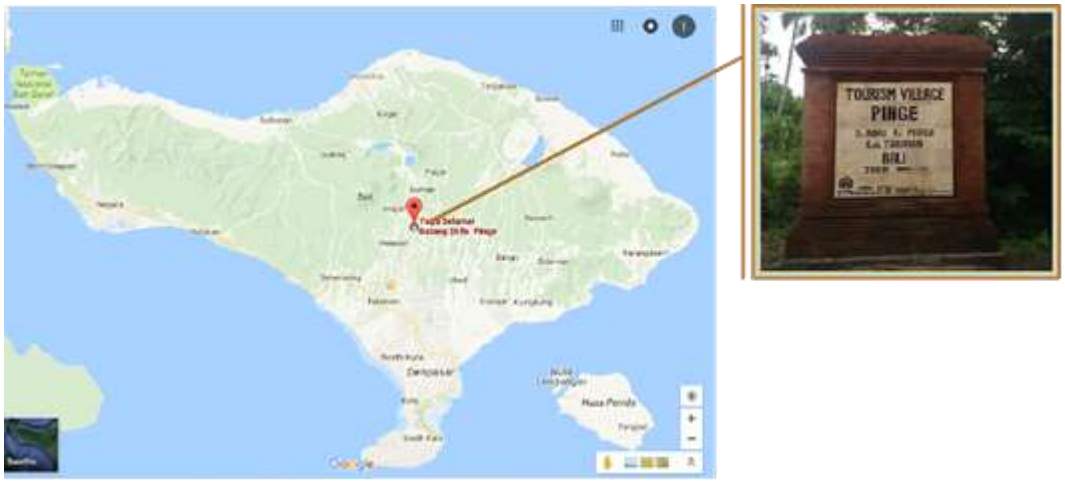

Fig. 1. Map of Pinge Village Location
Source: Central Bureau of Statistics of Bali Province (processed by researchers).

Determination of the location of the study was carried out by purposive sampling, namely in Pinge Village, Marga District, Tabanan Regency. The reason for choosing the location is Pinge Village has natural potential, *subak* as local wisdom and demographic characteristics support for the development of tourism village ta and supported by a geographical position that is close to other tourist objects, making it an attractive tourist destination package. The target of the activity was the Pinge Village community, the Regional Government, and stakeholders other relevant.

The data in this study were collected through questionnaires, in-depth interviews, and focus group discussions (FGD). The type of data that will be used is perceptual and existing

data so that the analytical method used in this study is a quantitative approach and in the form of descriptive qualitative, used to analyze the general description of the demographic and socio-economic characteristics of the Pinge Village community. SWOT analysis and qualitative approaches to capture behavior and target perceptions (Rangkuti, 1997) [14].

RESULTS AND DISCUSSIONS

Subak Potential in Supporting Pinge Village as Tourism Village

One way to preserve *subak* is to synergize *subak* with tourism activities, therefore tourism activities are needed in the *subak* system as an effort to empower and maintain the sustainability of the *subak* system itself. The role of *subak* in supporting tourism activities in the village is as follows.

(i)Providing land for facility, like jogging track, in the area of 4 km (4,000 m) of Pinge Village with a route jogging through residential villages, bamboo forests, stretches of rice fields and plantations that are very beautiful. Tourism is guided to enjoy the beautiful natural scenery of rice fields, in addition tourists can see the daily activities of the residents of Pinge Village.

(ii)Tourists which is visiting Pinge Village can participate or be directly involved in farming activities in the fields, such as planting rice and plowing fields.

(iii)*Subak* members routinely carry out religious ceremonies both in the *Subak Temple* and in the rice fields. This ceremony is an interesting attraction for tourists who come to Pinge Village.

The potential that can be developed is agro-tourism such as the use of agricultural land to grow vegetables and flowers that can be directly picked by tourists. This agro-tourism potential has not been well organized so it needs to be developed to attract domestic and foreign tourists.

Potential Attraction in Developed Pinge Village (Beside *Subak*) and Strategy for Developing Pinge as a Tourism Village

The potential that can be developed in Pinge Village (beside *subak*) is as follows.

(i)Traditional dance performances, such as *Leko* and *Bumbung Gebyog Dance*, which are the legacies of traditional Balinese dance with the characteristic of gamelan using musical instruments from bamboo, which are sacred and unique dances that are inherited from generation to generation by the people of Pinge Village.

(ii)The relics of ancient objects in the *Natar Jemeng Temple* which are historical relics found in the temple are very sacred by the people. This temple is located at the end of the village with views of rice fields that are very beautiful.

(iii)The structure pattern of traditional houses, which are mostly still traditional, the structure of houses in Pinge Village is still traditional with the uniqueness of places of family prayer (meandering) that are *meulu* or based on the road. The Pinge Village community has a regulation or *awig-awig* that prohibits people from building past the *penyengker* or gate, so that the houses in Pinge village are neatly arranged, clean and very beautiful. This is the main attraction for tourists who come to visit.

(iv)Another potential that can be developed that is interesting for tourists is knowing the life and daily activities of the Pinge Village community from morning to night. Tourists are invited to feel how life in the village with all daily activities.

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SWOT Analysis (Mapping Internal and External Factors of Development Tourism Village)

Pinge Village as Tourism Village uses SWOT analysis namely Strengths, Weaknesses, Opportunities, and Threats to formulate strategies through mapping identification of internal and external factors. SWOT analysis is a systematic identification of various factors to formulate a strategy. This analysis is based on the logic that maximizes the strengths and opportunities, but simultaneously to minimize the weaknesses and threats. The process of strategic decision making is always related to the taking of missions, objectives, strategies, and company policies (Rangkuti, 2000) [13]. Factor identification is compiled based on the results of an assessment of the object of tourist attraction and readiness for development community-based tourism. All potential factors from the community as well as weaknesses are internal factors, while all opportunities and constraints originating from outside the village become external factors.

Mapping internal and external factors in tourism development in Pinge Village as a community-based tourism village includes 34 factors consisting of 19 internal factors and 15 external factors. The following is the identification of internal and external factors in the development of Pinge Tourism Village.

Internal factors such as strengths include community willingness to participate, positive perceptions of sustainable tourism, the existence of arts traditional and local culture, the attraction of the village with unique views of rice fields and traditional Balinese houses, openness and friendliness of the population and the economic motivation of the community in developing tourism villages, community compliance with traditional leaders. While internal factors such as weakness are community participation tends to be as executors, community decision making is still low, education is low, tourism infrastructure is inadequate, not all involved stakeholders are, there is still a low level of mastery of foreign languages, especially English from the community, poor internet signals and networks and limited access to capital.

External opportunities include the support of the Regional Government, the positive attitude of the community, the location of the village adjacent to other tourist villages, market opportunities, the development of promotional media, stable economic development, adequate infrastructure, the development of tourism travel services. While the external constraints that are still faced are the possibility of social disparity, lack of marketing service capabilities, sustainability of partnerships with stake holders, continuity of funding, the impact of cultural suitability of the community.

Seeing internal and external conditions in the development of tourist villages in Pinge Village, a comprehensive and integrated strategy is needed from internal and external positions so as to strengthen the development of tourism potential. Some of these strategies are:

(a)Active community involvement from planning to implementation and evaluation; (b) Village program development according to the potential of local culture; (c) Establishment of management media in tourist villages; (d) Promotion of community-based tourism programs; (e) Build cooperation or

synergy with other tourist villages in the form of tour packages; (f) Development of potential villages adjacent to Pinge Village; (g) Improving the quality of the community in tourism management through technical and managerial training; (h) Increasing public awareness of environmental conservation; (i) Strengthening partnerships between stakeholders; (j) Intensification of community assistance in every stage of development of tourist villages; (k) Strengthening socio-economic and cultural institutions of the community; (l) Development of the creative economy of the community through innovation; (m) Increasing accessibility and supporting infrastructure that pay attention to ecological principles.

Table 1.SWOT Diagram of Potential Development of Pinge Tourism Village

Internal Factors External Factors	*Strengths* (S) Internal strength factors: 1.The desire of society to participate in the development of rural tourism; 2.positive perception of society regarding rural tourism a sustainable; 3.existence of traditional art, traditional houses and historic heritage; 4.attraction of the village unspoiled with rice paddy views; 5.existence of cultural and traditional agricultural tradition attractions that become a tourist attraction; 6.Openness and friendliness of the population towards visitors/tourists; 7.There is economic motivation for the community with the development of tourist villages; 8.There is influence and community compliance with local community leaders; 9.The existence of a *subak* system that supports tourism.	*Weaknesses* (W) Internal weakness factor: 1.Participation the community tends to be an executor or not involved in the level of planning and evaluation activities; 2.Decision making by the community is still low; 3.The background of community education is still low; 4.Not all stakeholders are involved; 5.Foreign language of the community, especially English, is still lacking; 6.The telephone facilities and internet signals are not good; 7.Limited access to capital and financial institutions.
Opportunities (O) External opportunity factors: 1.Support of Local Government in developing tourism villages; 2.Positive attitude of the community in receiving tourism village programs Village; 3.Location which is adjacent to other villages that also have tourism potential to become tourism packages; 4.Opportunities for market share for tourism potential; 5.The development of electronic media in supporting tourism promotion; 6.Stable economic and security development; 7.Infrastructure in general is quite adequate; 8.Development bureau of services/tourist travel agents; 9.Development of village tourism destinations.	*SO Strategic* Strategies that optimize strengths to take advantage of opportunities, namely: 1.Active community involvement from planning to implementation and evaluation; 2.Village program development according to the potential of local culture; 3.Establishment of management media in tourism village; 4.Promotion community-based tourism village program; 5.Build cooperation or synergy with other tourist villages in the form of tour packages.	*WO Strategic* Strategies that minimize weaknesses to take advantage of opportunities: 1.Intensification of community assistance in each stage of ecotourism development; 2.Strengthening socio-economic and community culture institutions Community; 3.Developing the creative economic business through innovation.
Threats (T) External threat factors: 1.Possibility of social disparity in tourism village development; 2.Lack of ability tourism village marketing services; 3.Accessibility to tourism villages is still inadequate; 4.Sustainability of partnerships between stakeholders; 5.Continuity of funding in tourism village development; 6.Impact of pollution and waste of homestay; 7.Conformity of culture of local communities and foreign tourists.	*ST Strategic* Strategies that optimize strengths to overcome the threats: 1.Developing potential village adjacent Pinge Village; 2.Community quality improvement in tourism management through technical and managerial training; 3.Community awareness raising on environmental conservation; 4.Strengthening partnerships a the stakeholders.	WT *Strategic* Strategies that minimize weaknesses to deal with threats: 1.Increased accessibility and supporting infrastructure that pay attention to ecological principles.

Source: processed by researchers (2018).

Based on the results of the identification of the development of Pinge Tourism Village that the strength factor possessed is still greater than the weakness. This condition indicates that the internal potential of both the individual capacity of the community and the support of the Regional Government and the potential of natural, social and cultural resources can minimize the weaknesses in the limitations of infrastructure, institutional structures and economic opportunities.

Table 2.Analysis of Internal Factors

Internal Strategy Factors		Weight	Score	Values
Strengths				
1	The desire of society to participate in the development of rural tourism	0,06	2,83	0,17
2	positive perception of the public regarding sustainable tourist village	0.05	2.33	0.12
3	The presence of traditional art, traditional houses and historic heritage	0.06	2.99	0.18
4	Unspoiled village charm with views of rice fields	0.05	2.37	0.12
5	Traditional culture and attractions of traditional farming that are tourist attractions	0.04	1.99	0.08
6	Openness and hospitality of the population towards visitors / tourists	0.04	2.01	0.08
7	There is economic motivation for the community with the development of tourist villages	0.06	2.71	0.16
8	There is influence and community compliance with local community leaders	0.06	2.87	0.17
9	The existence of a *subak* system that supports tourism	0.04	2.13	0.09
Total		0.46		1,16
Weaknesses				
1	Community participation tends to be as an executor or not involved in the level of planning and evaluation of activities	0.05	2.60	0.13
2	Community decision making is still low	0.03	1.54	0.05
3	Community education background is still low	0.06	2.83	0.17
4	Not yet involved all stakeholders (*stakeholders*)	0.03	1.48	0.04
5	Mastery of the foreign language of the community especially English is still lacking	0.07	3.23	0.23
6	Network facilities and internet signals are lacking good	0.08	3.92	0.31
7	Limited access to capital and financing institutions	0.05	3.05	0.15
Total		0.37		1.08
Difference in Strength and Weakness				0.08

Source: processed by researchers (2018).

Therefore there needs to be intensive efforts in developing economic opportunities through the Tourism Village business and utilizing the potential of resources and strong social capital in the community.

The results of identification of the development of community-based Pinge Tourism Village that external factors are greater opportunities than threat factors.

This condition shows that the tourism potential of Pinge Village is quite potential in capturing external opportunities in the face of all possible external threats that can arise at any time.

Internal and external conditions faced by the community demand the importance of community capacity building strategies both in creating economic opportunities and maintaining the existence of the environment and culture as well as the strength of the institutional structures in society.

Based on the results of the mapping, the results of the SWOT matrix that the existence of natural resource and cultural potential of Pinge Village and community capacity are in quadrant I indicated by the value of internal factors is 0.08 and external factors 0.90.

Industrial position in quadrant I is a very favorable position where Pinge Village has the power so that it can take full advantage of the opportunities.

The strategy implemented is to support aggressive growth policies through increasing the role and capacity of the community as the main actors in the development of Tourism Village and supported by the availability of

infrastructure, strengthening community institutions and cooperation between stakeholders.

Table 3. Results of External Factor Analysis External

External Strategy Factors		Weight	Score	Value
Opportunities				
1	There is support from the Regional Government in developing tourism villages	0.06	3.42	0.21
2	Positive attitudes of the community in accepting tourism village programs	0.06	3.29	0.20
3	Location of villages adjacent to other villages that also have tourism potential to be tour package	0.06	3.08	0.18
4	Opportunities for market share for tourism potential	0.05	2.58	0.13
5	Developments in electronic media to support tourism promotion	0.05	2.96	0.15
6	Economic and security developments stable	0.05	2.92	0.15
7	Infrastructure in general is adequate	0.05	3.05	0.15
8	Development of bureau services/tourist travel agents	0.05	2.6	0.13
9	Development of tourist village destinations	0.05	2.57	0.13
Total		0.48		1.42
Threats				
1	Possibility of social disparity in the development of tourist villages	0.03	1.73	0.05
2	Lack of tourism service capabilities of tourism villages	0.03	1.58	0.05
3	Accessibility to tourism villages is still inadequate	0.03	1.63	0, 05
4	Sustainability of partnerships between *stakeholders*	0.04	2.52	0.10
5	Continuity of funding in the development of tourism villages	0.05	2.61	0.13
6	Impact of pollution and waste from homestay	0.03	1.67	0.05
7	Cultural conformity of the community local and foreign tourists	0.04	2.37	0.09
Total		0.25		0.52
Difference in Opportunities and Threats				0.90

Source: processed by researchers (2018)

Collaborative Model and Policies That Can Be Built by Local Government and Related Stakeholders

The cooperation model that can be built by Pinge Village is to cooperate with the government, private sector and academics (triple helic). The government in this case the Regional Government of Tabanan Regency provides assistance and policies, from the private sector and state-owned enterprises to provide financial assistance or grants for the manufacture of tourism infrastructure and also help in terms of tourism promotion. While from the academics can contribute ideas in the form of studies and provide training that supports the development of Human Resources in the development of Pinge Village as a sustainable tourism village, so that it can increase economic growth in the village which will eventually lead to the welfare of the Pinge Village community. To be able to properly manage the Pinge Tourism Village, a Tourism Village Management Board should be formed consisting of elements from the government, traditional leaders, and *subak*. Which later this management body functions as a place to coordinate and can be a manager who manages the tourists who come.

The role of community organizations is very important because the community is the stakeholder main and will benefit directly from the development and management of tourist villages. Coordination between stakeholders also needs attention. The establishment of a forum or advisory board will greatly help with a fair and effective management pattern, especially in areas where tourism village is the main source of income for the local community. Some of the criteria used are as follows.

-A partnership between the community and built tour operators was to market and promote Tourism Village products; and between community institutions and the Tourism Office.

-There is a fair distribution of income from tourism services in the community.

-Community organizations make guides for tourists. As long as tourists are in the community area, tourists/guests refer to the ethics written in the guide.

-Community based economy. Homestay is an accommodation system that is often used in Tourism Villages. Homestay can cover various types of accommodation from simple accommodations that are managed directly by the family to staying at a local family home. Homestay is not only an accommodation option that does not require high capital, with the system homestay-owners can directly experience the economic benefits of tourist visits, and the distribution of benefits in the community is more secure. The system of homestay has a high value as a product of tourism village where a tourist gets the opportunity to learn about nature, the culture of the community and daily life in that location. Tourists and host parties can get to know each other and learn from each other, and with that can foster better tolerance and understanding. Homestay according to the tradition of Indonesian hospitality. In the Tourism Village, guides are local people whose knowledge and experience of the local environment and nature is the most important asset in the services provided to tourists. Likewise, a local guide will feel firsthand the economic benefits of the Tourism Village, and as a manager will also preserve the nature and tourism objects.

CONCLUSIONS

Based on the results of data analysis and discussion it is known that the *subak* potential in supporting Pinge Village as a tourist village are: (i) Availability of land for jogging track facilities in the 4 km (4,000 m) Pinge Village area with jogging routes through residential villages, forests bamboo, rice fields and plantations that are very beautiful; (ii) Tourists visiting Pinge Village can participate or be directly involved in agricultural activities in the fields, such as participating in planting rice and plowing fields; (iii) *Subak* members as cultural supporters and religious ceremonies both in the *Subak* Temple and in the rice fields. This ceremony is an interesting cultural attraction for tourists.

Potential attractions in Pinge Village that can be developed in addition, to *subak* are traditional dances, such as *Leko and Bumbung Gebyog Dance* which are the legacies of traditional dance, traditional Balinese traditional houses and invite tourists to recognize daily life activities in Pinge Village.

The strategy for developing Pinge Village as a tourism village is in accordance with the results of the SWOT matrix, it is known that the existence of the natural and cultural resource potential of Pinge Village and community capacity is in quadrant I. Industrial position in quadrant I is a very favorable position where Pinge Village has the power to take advantage of opportunities there is a maximum. The strategy implemented is to support aggressive growth policies through increasing the role and capacity of the community as the main actors in the development of Tourism Village and supported by the availability of infrastructure, strengthening community institutions and cooperation between stakeholders.

The cooperation model and policies that can be built by the local government and related stakeholders are: The cooperation model that can be built by Pinge Village is to cooperate with the government, private sector and academics (triple helic). The government in this case the Regional Government of Tabanan Regency provides assistance and policies, from the private sector and state-owned enterprises to provide financial assistance or grants for the manufacture of tourism infrastructure and also help in terms of tourism promotion. While from the academics can contribute ideas in the form of studies and provide training that supports the development of Human Resources in the development of Pinge Village as a sustainable tourism village.

Based on the problems that are still faced in the development of Pinge Village as a community-based tourism village, several suggestions or recommendations are proposed as follows:

-Improving the quality and capacity of the community towards developing Tourism Village in Pinge Village in a sustainable manner by promoting environmental and cultural sustainability through technical training and managerial so that it is more innovative in creating tourist attractions and capturing economic opportunities which are expected to improve people's lives.

-Strengthening and optimizing the role of local institutions in the community at each stage of the development of Tourism Village which involves the community directly starting from the planning, implementation to evaluation stages. The goal to be achieved is not only to create economic opportunities but also to increase public awareness of environmental sustainability and maintain cultural heritage that has high religious values.

-Strengthening and developing a collaboration network quadruple helix that involves Local, Private, Higher Education and the most important is the active participation of the community in each stage of the development of tourism villages.

-Improving tourism services in the form of providing adequate infrastructure starting from road infrastructure, environmental hygiene, internet network, restaurants, craft or souvenir centers and homestays and tourism promotion techniques with an environmentally friendly concept and creating a multiplier effect from each infrastructure provision.

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STATE OF CULTURAL TOURISM IN THE CITY OF PLOVDIV IN THE PERSPECTIVE OF BEING THE EUROPEAN CAPITAL OF CULTURE

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Abstract

The city of Plovdiv in Bulgaria was elected by the European Commission to be the European Capital of Culture for 2019. Plovdiv is a city with eight thousand years of history located on one of the most fertile plains in Europe - the vast plain of Thrace, inhabited for thousands of years by various tribes and peoples. Eight civilizations and cultures inhabited the city: Prehistoric, Thracian, Macedonian, Roman, Byzantine, Old Bulgarian, Ottoman, Renaissance and contemporary culture. They left a rich, unique and priceless cultural heritage. For centuries in Plovdiv there have been living together Orthodox, Catholic, Muslim, Jewish, Armenian and other communities. Therefore the city has a rich variety of religions and remarkable monuments of the different religious cultures and cults. The subject of the present study is the state of cultural and historical tourism in the city of Plovdiv. The period 2015-2017 has been examined. The data required for the study are taken from the statistical reports. In 2017 a survey was conducted among 120 tourists during the seasons: spring, summer and autumn. The purpose of the survey was to determine the state of cultural and historical tourism in the city of Plovdiv. Moreover, for the purpose of the study a working group of 10 experts has been set up - experts in areas relevant to the development of cultural tourism in the city of Plovdiv. Each of the experts makes suggestions about the circumstances, conditions and factors on which the further development of cultural tourism in the city of Plovdiv depends. In this way, the assessment of both the experts in this sector and the users of this tourist product has been established. A SWOT analysis of the strengths and weaknesses of cultural and historical tourism in the city of Plovdiv has been carried out.

Key words**:** *cultural tourism, historical tourism, opportunities and development, Plovdiv*

INTRODUCTION

In the recent years in Bulgaria there has been an increase in the number of tourists both foreign and Bulgarian. Besides the most visited countries of the EU for years, the new member states which adhered during the last 15 years have become important more and more important tourist attractions on the tourist map of Europe [10].

Tourism is a priority branch of the Bulgarian economy, forming a significant part of the gross domestic product of the country [5].

The cultural and historical heritage of a country plays a major role in promoting its reputation and in directing public's interest in recognizing, learning and obtaining fuller and lasting perception and understanding of its values [7].

There is also an increasing interest in the already established tourist destinations, cities with rich cultural heritage such as Veliko Tarnovo, Plovdiv and Rousse. The largest territorial concentration (over 100) of monuments of national importance in 3 districts - Veliko Tarnovo, Plovdiv and Sofia represents 17.8% of the total number of monuments [4]. Significant is the increase in the number of tourists' visits to places where there is an opportunity to combine cultural and historical tourism with balneological, spa and sea tourism – the town of Hissar, the town of Nessebar, the town of Sozopol, the city of Plovdiv, the town of Velingrad. Therefore, tourism services in the rural areas are able to support local population and communities in developing economic diversity [9]. During the past five years, the tourist flow to these destinations has increased with 12%. The interest, the needs and the attitudes of the modern tourist are various, therefore combining cultural historical tourism with balneotherapy and spa both sea and mountain, enormously improves the tourist flow to this type of destinations.

The city of Plovdiv is one of the well-known and popular destinations for cultural tourism. It is generally accepted that the object of this study, the city of Plovdiv, was named after Philip II Makedonski, the father of Alexander the Great and conqueror of the city in the 4th century BC. The city of Plovdiv has eight thousand years of history and is located on one of the most fertile plains in Europe - the vast plain of Thrace, inhabited for thousands of years by various tribes and peoples. Eight civilizations and cultures inhabited the city: Prehistoric, Thracian, Macedonian, Roman, Byzantine, Old Bulgarian, Ottoman, Renaissance and contemporary culture. They left a rich, unique and priceless cultural heritage. For centuries in the city of Plovdiv there have been living together Orthodox, Catholic, Muslim, Jewish, Armenian and other communities. Therefore the city has a rich variety of religions and remarkable monuments of the different religious cultures and cults. Very favorable fact for the development of a sustainable cultural historical tourism is that the city of Plovdiv is associated with many other unique internationally known archaeological sites, located at about sixty minutes drive: the valley of the Thracian kings with the world-known Kazanlak tomb, the Valley of the Roses, the Valley of the Wine, the unique natural wealth of the Rhodope Mountains and many SPA resorts, eco-, rural, mountain, culinary, folklore and other kinds of tourism. All this gives unlimited possibilities to organize an integrated tourist product, which is extremely attractive and entices many tourists.

The city of Plovdiv has been elected by the European Commission to be the European Capital of Culture in 2019. It is of utmost importance for the Municipality of Plovdiv in terms of improving the infrastructure resources for tourism and their development in the next programming period [6].

The purpose of the this study is to determine the state of cultural and historical tourism in the city of Plovdiv. To establish the assessment of both of the users of this tourist product and the experts in this sector. On the basis of the study and the analysis unused opportunities have been revealed as well as conclusions and recommendations for achieving sustainable development of this type of tourism in the city of Plovdiv have been formulated.

MATERIALS AND METHODS

In the majority of literary resources, cultural tourism has been defined as "the movement of people to cultural attractions far away from their place of residence, with a cognitive purpose and experiences to satisfy their cultural needs" [1]. The World Tourism Organization (WTO) defines cultural tourism as "a movement of people with a strong cultural motivation to visit sights, monuments, museums, festivals and other cultural events, to study nature, folklore and art or pilgrimage" [2]. UNESCO gives its definition of culture in the following way: "Culture is the multitude of distinctive spiritual, material, intellectual and emotional traits of a society or a community group; it also covers art and literature, lifestyle, forms of cohabitation, moral norms, traditions and beliefs "[3]. According to the European Center for Traditional and Regional Cultures (ECTARC), the sites that attract tourists for cultural and historical tourism are: archaeological sites and museums; architectural monuments (ruins, famous buildings); art, sculpture, crafts, galleries, festivals, events; music and dance (classical, folklore, modern); drama (theater, movies, drama); linguistic and literary training, events; religious festivals, religious pilgrimage; mixed, folklore and primitive cultures and subcultures [11].

Tourism is no longer activity of a privileged minority but it is widespread among the majority of citizens of the European Union. The social importance of cultural tourism is expressed in the formation of positive and negative socio-cultural impacts on society. It contributes to the mutual understanding among the peoples. The World Tourism Organization recognizes it as one of the means of promoting respect for human rights

regardless of race, sex, language or religion; to strengthen people's understanding and to increase the well-being of the people. Cultural tourism is also a means of expanding the territory for practicing tourism. Cultural tourism has a beneficial influence also through its economic impact.

The subject of the present study is the state of cultural and historical tourism in the city of Plovdiv. The period 2015-2018 has been examined. The data required for this study have been taken from the statistical reports in the municipality of Plovdiv and from the NSI. In 2017 a survey was conducted among 120 tourists during the seasons: spring, summer and autumn. Moreover, for the purposes of the study, a working group of 10 experts in tourism and in fields relevant to the development of cultural tourism in the city of Plovdiv has been set up. Each of the experts makes an objective assessment of the circumstances, conditions and factors that determine the development of cultural historical tourism in the city of Plovdiv as well as they make proposals and a prognosis for its future sustainable development.

RESULTS AND DISCUSSIONS

Prerequisites for the development of cultural and historical tourism in the city of Plovdiv

Cultural and historical cognitive tourism in the city of Plovdiv develops on the basis of a unique cultural and historical heritage layered over centuries and millennia. The city of Plovdiv is a popular tourist destination due to the concentration of a large number of cultural and historical heritage - remains of different ages: Neolithic, Antiquity, Middle Ages, Renaissance. The city has unique examples of the architectural and monumental art of Roman and Byzantine temples from the earliest periods of Christianity, Ottoman mosques and churches from the Renaissance period [9]. The various sites- churches, schools, urban architecture, museums depicting the ethnic and cultural diversity of the city of Plovdiv are a very rich resource which is a strong asset for the development of tourism.

The list of cultural values of national and local importance includes more than 715 individual cultural sites. There are 45 sites in the city included in the list of the cultural monuments of national importance. There are over 245 cultural sites of ensemble significance, the most famous of which are located in the historic area of Philipopol - Trimontium - Plovdiv, the Old Town and the Kapana area [8]. This allows visitors to get more information and a to have a more complete knowledge of the era. The city of Plovdiv is the city of the hills: Sahat tepe, Bunardzhika, Dzhendem tepe, Nebet tepe have been declared as natural protected areas with rare plant and animal species.

The climate is relatively mild - relatively mild winter and hot but wet summer, long soft autumn, i.e. there is a long season for outdoor events. The anthropogenic resources for the development of the tourism in the city of Plovdiv are above the average for the country and Europe.

The main tourist sites (cultural, religious, historical, etc.) in the city of Plovdiv are:

-architectural and historical reserve ''Old Plovdiv";

-museums*:* regional museum of archeology, regional ethnographic museum, regional museum of history, exposition "Bulgarian Revival", exposition "Union of Bulgaria 1885", exhibition "Bulgarian Literature Publishing", Museum of Modern History, Regional Museum of Natural History, etc.;

-galleries: city art gallery - Plovdiv, icon gallery, permanent expositions "Tsanko Lavrenov" and "Mexican art", permanent exhibition of painting "Encho Pironkov";

-religious temples;

-archaeological sites: Nebet Tepe Archaeological Complex, Antique Theater, Antique Forum with Odeon, Antique Stadium, Late Antique Building „Eirene“, Hissar Kapia, Clock Tower of Sahat Tepe, Balabanov House, national revival houses, galleries, expositions, etc.;

-places of relax and culture: King Simeon's garden, the old town garden with the colorful Thursday market, the Olympic rowing canal,

sports and entertainment centers, home of science and technology.

In the city of Plovdiv there are natural sites with potential for valorisation: one of the largest Bulgarian rivers - Maritsa and the six rock hills (tepeta). Tepetata in a tourist sense are used to give a general idea of the city and are important for the residents of the city of Plovdiv as good places for walk and relax.

By analyzing the main resources and assets that create the material base for the development of cultural and historical tourism in the city, we can say that the city of Plovdiv has not enough bed base, which will not be able to accommodate the expected tourist flow in 2019. In 2017 in the city there were 171 functioning accommodation places with more than 10 beds in the site - hotels, motels, campsites, chalets and other accommodation facilities. The number of rooms in this type of accommodation is 4.600 and the number of beds is 8.700. Compared to 2016, the total number of accommodation places increased with 1.8%, while the number of beds remain unchanged.

The total number of overnight stays in 2017 in all accommodation places in the city amounts to 77.000, or 13.3% more than in the previous year. 60.500 overnight stays have been made by Bulgarian citizens, and 16.500 - by foreigners.

Table 1. Economic indicators of the state of tourism in the city of Plovdiv

Indicators	2016	2017	Dynamics 2016 =100%
Overnight stays	483,762	526,180	108.76
Including foreigners	225,477	260,176	115.39
Persons stayed overnight	470,449	514,436	109.35
Occupied beds	29.45%	31.93%	+ 8.42
Average period of stay (nights)	1.79	1.78	99.44
Income from overnight stays for the hotel owners, BGN	25,097,529	260,210,801	103.68
Income from TT and TC, BGN	424,263	492,961	116.19

Notes: TT - tourist tax; TC – taxes from categorization
Source: Statistical reports in the municipality of Plovdiv.

It was established that 60.20% of the total number of overnight stays by foreign tourists were spent in 4 and 5 star hotels. It is known that foreign citizens always prefer high category accommodation places, especially for security reasons and to a lesser extent because of the better quality of facilities and service. The Bulgarian tourists account for 36.70% of the total number of overnight stays in 4 and 5 star hotels. In the 3-star accommodation places, 32.60% of the overnight stays were made by foreigners and 36.80% by Bulgarian citizens. In the remaining 1 and 2-star accommodation places, this ratio is changing: foreign tourists account for only 7.20% of the total number of overnight stays and the Bulgarians for 26.5%

In 2016, a total of more than 447 thousand tourists have stayed in accommodation places with a minimum of 10 beds in Plovdiv region which is an increase of nearly 11% compared to 2015 according to NSI data. In 2016, the total number of overnight stays was 942 thousand which is almost 8% more than those in 2015.

The average number of overnight stays by foreigners in all accommodation places in 2017 is 2.4. 23.0% of the foreign tourists visiting the city of Plovdiv, who stayed overnight are citizens of Turkey, 9.2% of Greece, 7.0% of Italy, 6.2% of Germany and 3.9% of the United States.

In 2017 compared to 2016, there was an increase of 9.35% in the persons stayed overnight and total amount of 8.76% in the overnight stays. The number of foreign people stayed overnight increased with 12.32% which means that an increasing number of foreigners visit the city as tourists. The overnight stays of foreigners increased with 15.39%. However, the occupation of the accommodation base is unsatisfactory: in 2016 it was 29.45% and in 2017 it increased to 31.93% which is 2.48% more. The average period of stay is almost the same in the two years. One day and one weekend visits by Bulgarian tourists are more so the number of overnight stays is less.

The economic results of the development of the tourism in the city of Plovdiv are positive. Income from overnight stays is calculated over BGN 40.4 million, which is an increase

of nearly 10% compared to the previous year. In 2017 compared to 2016 there was an increase in the overnight stays with 3.68% for the hotel owners. Tourist tax income and a 16.19% taxes from categorization present an increase of the tourism tax income with 14.27% and an increase of the income from categorization taxes with 24.06%.

The income from the tourist tax (from overnight stays) in the funds for accommodation in the municipality only until the end of August 2017 amounts to more than BGN 250.000, which is 8% more than that for the same period in 2016. This also shows that half of the tourist visits are made during the dry spring-summer months. The other half of the tourist visits take place during the mild fall in the city of Plovdiv and its region.

The revenues from the collected tax from overnight stays for the same period represent 72% of the total budget of Plovdiv Municipality's Annual Program for Tourism Development in 2017.

For the eight months of 2017 there is also a significant increase in the funds accrued by charges for the categorization of tourist sites. The amount is 45% higher than those collected for the same period in 2016.

The tourist flow in the city has increased twice over the last six years. In 2016 more than 800,000 tourists visited the city of Plovdiv. In 2019 when the city of Plovdiv will be the European Capital of Culture more than 2 million visitors are expected.

Cultural historical sites in the city are visited a lot. Trakart Cultural Center which stores unique priceless ancient mosaics in 2017 made 94,100 visits more than 2016 or there is an increase with 22%. The Tourist Information Centers in 2016 were visited by 39,961 tourists and in 2017 by 70.694 tourists. So in 2017 there were 30,733 more visitors which is an increase with 77%. In 2016 the foreign tourists represented 74.03% of the total number and in 2017 they were 80.42%. In 2017 visits of Bulgarian tourists increased with 33.35% compared to 2016 and visits by foreigners increased with 92.18% (almost double) which is indicative of the intensification of the interest especially by the foreign tourists towards cultural the historical heritage in the city of Plovdiv. The interest of foreign tourists to the old part of the city increases. While in 2016 foreign tourists were 29.19% of the total number of visitors, in 2017 they were 41.96% of the total number. Total visits to the old town increased with 9.31%. The number of the Bulgarian tourists decreased with 10.39% and the number of the foreign tourists increased with 57.09%.

The interest of foreign tourists increases in the Bulgarian traditions and particularly in the Thracian folklore. Visits to the regional ethnographic museum in 2017 increased with 10.37%. Foreign visitors are 36.25% of the total number of visitors. Visits to the Museum of Natural Science have increased with more visits by Bulgarians with 147.73% and by foreigners with 313.49%.

Table 2. Visits to cultural historical sites in the city of Plovdiv

Visits, number, in:	2016	2017	Dynamics 2016 =100%
Museums- total	432,535	526,635	121.75
Including foreigners	113,666	146,527	128.91
Old Plovdiv	246,984	270,001	109.31
Including foreigners	72,119	113,293	157.09
Ethnographic museum	64,267	70,933	110.37
Including foreigners	23,303	12,470	53.51
TIC- total	39,961	70,694	176.9
Including foreigners	29,584	56,856	192.18

Notes: TIC- tourist information center
Source: Statistical reports in the municipality of Plovdiv.

The following is typical of the city of Plovdiv: on one hand, the city is an established tourist destination; on the other – it is the second largest city in the country and it hosts a large number of events with the participation of many people with several peak occupancy periods of the bed base.

It is noteworthy that middle sized hotels with a better material base have recently been put into operation. The persistence and the increase of the tourist flow provide income for the hotels so there are no hotels with old and unrenovated facilities. The Tourism Development Program in the city of Plovdiv is in compliance with the Strategy for

Sustainable Development of Tourism for the period 2014-2020 as well as with the municipal plan for the development of the city during this period. The activities on the program are financially guaranteed in accordance with the income form the tourist tax and taxes from categorization of the tourist sites on the territory of the municipality.

The Municipality of Plovdiv makes a lot of efforts to develop cultural tourism in the city. There have been made public investments unprecedented so far to enrich the cultural content of public life in the city. In addition, a large number of private investors have been attracted through competitions to offer their own projects for cultural events. The municipality has signed over 250 contracts with cultural operators worth over BGN 8 million. All proposed projects are evaluated by an expert jury.

From our marketing survey carried out among 120 users of cultural and historical tourism in the city of Plovdiv it is clear that the main part - 34.2% of the total number of tourists with interests in cultural historical tourism are between 36 and 45 years old; 29.6% are at the age of 26 to 35 years or about 64% of fans of cultural historical tourism are young people. Young people at the age of 18 to 25 years represent 11.4% of the total number of tourists. The share of tourists at the age over 56 is small: 5.4% are between 46 and 55 years old and only 2.6% are over 65 years old.

According to the level of education, the users of this tourist product are predominantly with secondary education - 44.3% of the total number. Those with higher education are 34.7% and with high school - 12.6%. The lowest is the share of tourists with basic education- 8.4%. According to the tourists, the popularity of the cultural heritage in the city of Plovdiv is estimated as follows: the most numerous - 38% is the group of those who think it is very popular; 25% responded more likely yes; 18% - 19% think that the cultural heritage of the city of Plovdiv is not known. Regarding the means of promoting the architectural and cultural heritage of the city of Plovdiv, 39% of the respondents say that they learn from tourist guides; 32% learn from information sites; 17% - from information leaflets in the stores; and 12% learn from advertising panels on motorways and roads. 32% of respondents believe it is necessary to improve the advertisement of the cultural heritage of the city of Plovdiv.

The assessment of the tourists about the state of the architectural and cultural historical sites in the city of Plovdiv is as follows: more than half - 54% give an excellent assessment of their state; 27% rate it as very good; 11% give a good rating and only 8% give an unsatisfactory grade.

In the following paragraph it is made a SWOT analysis reflecting the experts' assessment of the strengths and weaknesses, opportunities and threats for the development of cultural tourism on the territory of the city of Plovdiv.

Results from the SWOT analysis:

The result for the strengths of cultural tourism in the city of Plovdiv is currently 0.88. For the development of cultural tourism, it is very important to have various, preserved and high-valued cultural and historical sites in the examined region which is in our case the city of Plovdiv. Therefore, the most points are awarded to a "multitude of cultural monuments", i.e. the rich cultural and historical heritage of the city with a large number of monuments from different historical eras. (8.5 points).

According to the results of the survey carried out during the seasons: spring, summer and winter in 2017 among 125 tourists, the majority of respondents visited the city of Plovdiv for the first time - 87% of the total number. This is indicative of the increasing interest in the cultural and historical sites in the city of Plovdiv. The high percentage of new "cultural" tourists is most likely provoked by the interest in the European capital of culture- the city of Plovdiv.

One-tenth of the total number of respondents - 10% visit the city for a third or more time. These are the permanent core of fans of cultural and historical sites in the city of Plovdiv. One third of all tourists stay in the city of Plovdiv for more than two days and 22% spend two days with one overnight stay.

These are tourists who want to visit all cultural and historical sites in the city. The variety and the diversity of cultural and historical sites is the reason for visits to the city by more than 50% of tourists.

Table 3. "STRENGHTS"

Cultural tourism	Current state			Expected state		
	importance	points	result	importance	points	result
Strengths	1		**0.88**			**1.20**
Various monuments of culture	0.45	8.5	3.82	0.2	10	2
Easily accessible by a vehicle	0.05	5	0.25	0.15	10	1.5
Presence of restaurants and party places	0.09	9.2	0,89	0.2	10	2
Sanitary-hygiene conditions in the tourist sites	0.04	7	0.28	0.05	8	0.4
No contamination from factories	0.07	5	0.35	0.05	9	0.45
Abundant tourist information for the sites	0.11	7	0.77	0.2	9	1.8
Safety during stay	0.08	5	0.4	0.05	9	0.45
Quality of the service	0.11	3	0.33	0.1	10	1

Source: Own calculations.

Therefore, the preservation and maintenance of these sites is of great importance for the development of cultural tourism in the city of Plovdiv.

For a whole day or for one afternoon the visitors get acquainted with the most accessible, closest and most famous historical sites or they participate in organized cultural events. Plovdiv municipality has a very rich cultural calendar with numerous cultural events. This type of tourists are half of the total number of tourists. That is why the reason for their visit and the specific purpose of staying in the city should be explored in detail and analyzed.

Over 83% of the total number of tourists are "very satisfied" with their knowledge of the cultural and historical sites in the city of Plovdiv, a quarter - 25% are "satisfied". These data are indicative once more of the seriousness of the problem with preserving and maintaining historical sites in the city because they are the main attraction for cultural tourism in the city. According to the poll, the most popular tourist sites are: the old town, the antique theater, the Roman stadium and Kapana area.

The least points experts give to the indicator "quality of the service" - 3.0. This is an indicator of the problem with the necessity to increase the professionalism of the employees in the field of tourism; as well as systematic and thorough preparation of highly qualified young and reliable personnel for this sector; to reduce and to stop staff turnover in tourist enterprises; to increase the linguistic preparation of the employed in tourism especially necessary in the city of Plovdiv due to the large number of foreign tourists. The sanitary and hygienic conditions in many tourist sites, restaurants and accommodation places are not at the required level.

The great variety of cultural and historical sites, cultural events and festivals, numerous restaurants and entertainment venues, accommodation places in the city are the strengths in the experts' prognosis and guarantee the development of cultural and historical tourism in the city of Plovdiv. Improving the quality of tourist services, information support and advertising are also crucial factors.

Quality of service, however, is a complex factor so its role and influence on the development of cultural tourism is unique. The prognosis predicts that the strengths of cultural tourism will increase with 0.32 points which is real and satisfactory given the overall socioeconomic picture.

The results for the weaknesses is 1.06

Much of the cultural and historical heritage in the city of Plovdiv is not in good state so the indicator "state of the sites of the cultural and historical heritage" has been awarded the lowest score - 6. A small number of points is also given to the indicator "bad sanitary hygiene conditions in tourist sites". The quality of the offered tourist product depends to a large extent on these indicators.

In the tourist business the condition of the tourist infrastructure is particularly important. In many sites it is inaccessible or old which is an obstacle to the intensive development of cultural and cognitive tourism.

Table 4. "WEAKNESSES"

Cultural tourism	Current state			Expected state		
	importance	points	result	importance	points	result
Weaknesses	1		**1.06**	1		**0.85**
Condition of the sites from the CHH	0.32	6	1.92	0.22	6	1.32
Prices in restaurants and party places	0.18	8	1.44	0.21	7	1.47
Advertising and marketing	0.04	9	0.36	0.2	8	1.6
Sanitary-hygiene conditions in the tourist sites	0.16	7	1.12	0.10	4	0.4
Information service	0.14	9	1.26	0.08	4	0.32
Territory infrastructure	0.08	9	0.72	0.10	5	0.5
Quality of the service	0.08	8	0.64	0.09	4	0.36

Notes: CHH – cultural historical heritage
Source: Own calculations.

Tourist advertising and marketing in the city of Plovdiv are at an unsatisfactory level and they turn into factors which limit the development of both cultural tourism and tourism as a whole. These common weaknesses in the tourism industry should be removed although this requires time, effort and significant financial resources.

In order to increase the overall effect of the cultural and historical heritage for the economy of the city of Plovdiv, it is necessary first to start an integrated offer of resources in adequate tourist packages, covering as much as possible the spatial combinations of tourism resources.

According to the experts' prognosis, the weaknesses of cultural tourism in the city of Plovdiv will decrease with 0.21 points. The condition of advertising and marketing will be strongly influenced by the weaknesses. In the same direction the following influencing factors are "the state of the sites of the cultural and historical heritage" and "poor quality of services".

The result for opportunities is 0.60

The realization of projects in the region will have a positive effect on the development of cultural tourism. There is a young work force in the city because of the high unemployment rate but these young people are not qualified and specialized to work in the field of tourism and they need training. Greater coordination of the actions of the state and municipal authorities will speed up the work on the maintenance of tourist sites and the training of young people for the sector. The development of small and medium-sized businesses, especially in sectors related to tourism will contribute by improving the quality of the tourist product. New archaeological monuments are still being discovered in the city and the surrounding area.

In order to increase the opportunities for the development of cultural tourism in the city of Plovdiv the most hopes are given to the "realization of projects financed by national, municipal and foreign resources". That is why the most points are awarded to this indicator - 5. Achieving a more complete coordination of the efforts of the municipal and state authorities and the local business will contribute to the creation of a more favorable business environment thus contributing to the development of cultural tourism.

Table 5. "OPPORTUNITIES"

Cultural tourism	Current state			Expected state		
	importance	points	result	importance	points	result
Opportunities	1		**0.6**			**1.1**
Realization of projects financed by national municipal and foreign resources	0.03	5	1.5	0.25	8	2
Coordination of the efforts of municipal, state and local business authorities	0.2	3	0.6	0.2	8	1.6
Available free work force	0.1	4	0.4	0.15	5	0.75
Construction of new transport connections	0.1	3	0.3	0.1	6	0.6
Development of small and medium enterprise business	0.2	3	0.6	0.15	6	0.9
Discovering new historical monuments in the city and its surroundings	0.1	3	0.3	0.15	5	0.75

Source: Own calculations.

According to the experts' prognosis the opportunities for the development of cultural tourism in the city of Plovdiv increase from 0.60 to 1.10 or with 0.50 points which can be realized. The prognosis gives the greatest hope to the influence of the factors:

"realization of projects financed by national, municipal and foreign resources" as well as "coordination of the efforts of the municipal and state authorities and the local business".

The result for threats is 0.95

The main threat to the successful development of cultural tourism in the city of Plovdiv is the lack of financial resources. The regulatory documents - laws and sub-economic provisions also do not support the development of cultural tourism.

Table 6. "THREATS"

Cultural tourism	Current state			Expected state		
	importance	points	result	importance	points	result
Threats	1		**0.95**			**0.73**
Insecure financing of the projects for cultural tourism	0.2	6	1.2	0.2	6	1.2
Gaps in the regulatory base for cultural tourism	0.2	5	1	0.15	4	0.60
Lack of good professionals	0.1	7	0.7	0.1	4	0.4
Lack of enough investments and financial stability of the entrepreneurs	0.1	5	0.50	0.1	4	0.4
High mobility of the young people towards other regions	0.25	5	1.25	0.25	4	1.0
Aging of sewage, power supply and roads	0.15	7	1.05	0.2	4	0.8

Source: Own calculations.

The indicator "lack of sufficiently qualified personnel" is considered a major threat for the future development of cultural tourism in the city of Plovdiv. The system for training and permanent re-qualification of personnel in the tourist sector needs revision and improvement.

The long-term effect on the development of tourism in the city of Plovdiv will have the training of well-trained and qualified personnel in the field of cultural and historical heritage and cultural tourism.

The lack of sufficient financial means - the indicator "insecure financing of cultural tourism projects" is a serious threat according to the developed expert prognosis for the development of cultural tourism in the city of Plovdiv. All activities to improve the state of cultural and historical heritage sites, accommodation and catering facilities and the quality of service are related to the availability of sufficient financial resources. However, generally speaking, the threats for the development of cultural tourism decrease with 0.22 points.

CONCLUSIONS

The performed analyzes allow to summarize the following conclusions:

-The city of Plovdiv has a very good resource potential for cultural historical tourism. The rich thousand years architectural and cultural-historical heritage of the city is a major factor and it guarantees the future successful development of cultural tourism;

-The municipality organizes a lot of events and happenings of local and national importance that contribute to the development of cultural tourism. A significant role is given to the public-private partnership in the field of culture;

-Located in the vast plain of Thrace, the city of Plovdiv is associated with the unique, widely known in abroad archaeological sites: The Valley of the Thracian Kings with the world-famous Kazanlak Tomb, the Valley of the Roses, the Valley of the Wine, the unique natural wealth of the Rhodope Mountains, and countless SPA, eco, rural, mountain, culinary, folklore and other kinds of tourism. All of them are located at about sixty minutes drive from the city of Plovdiv. All this gives unlimited possibilities to organize an integrated tourist product which is extremely attractive and entices many tourists.

-a large number of available tourist resources are not used for example: hills are currently not sufficiently utilized for the purposes of tourism. The Maritsa River is unattractive due to its low water level, large, water-borne areas overgrown with shrubs and weeds which does not contribute to the creation of an aesthetic and ecological environment;

In order to achieve a more sustainable development of cultural and historical tourism in the city of Plovdiv it is necessary:

-to improve the preservation and maintenance of tourist sites;
-to improve the quality of service for tourists. A very important element of this problem is the improvement of the professional level of the personnel employed in the tourist sector and the information offices. The training should include both permanent training and qualification of the already employed as well as training of highly qualified young employees for the sector;
-the lack of sufficient financial resources requires encouraging of investment in the tourist sector;
-there is a need to promote advertising, information service and marketing;
-there should be created and updated a positioning map of the cultural historical sites and attractions;
-accessibility, transport connections and communications should be improved at regional and local level.

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IMPROVEMENT OF THE MECHANISMS OF LAND USE OF FARMING ENTERPRISES IN UKRAINE

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Abstract

The aim of the research is to argue theoretical fundamentals and develop practical recommendations concerning improvement of the mechanisms of land use of farming enterprises in Ukraine. The calculated indicators of land supply, presented in the paper, confirm the tendency to consolidation of farms; actualization of the problems of establishment of new farms by restriction of lands and still not organized turnover of agricultural lands; forcing out of the system of landholding and land use. It is defined that family farming eventually demonstrates better indicators of efficiency of land use and ecological load on land (a lower level of plowing). The research characterizes legitimation of agricultural land turnover in favor of development of family-farming model of agriculture, protection of village communities, multi-functional development of rural territories, food self-sufficiency of the state and environmental protection. The work proposes to provide free land parcels, which are determined by the audit, to the people, who wish to start or expand their family farming not by means of an auction, but by immediate obtaining of land according to the resolution of local authorities on the base of land contests. In the contests, the principle criterion to name a winner considers conditions of the following land parcel use and consistency of performance of the future farming enterprise.

Key words**:** *farms, land, land use, production potential*

INTRODUCTION

Nowadays, Ukraine experiences intensive use of land resources and a high level of economic employment of land areas. In 2017, agricultural lands constituted 68.7 % of the total area of Ukraine, and the area of plowed land occupied 78.4 % [12, p. 65]. Scientists report about poor efficiency of application of organizational and economic mechanisms of rational land use, imperfect management of use, protection and reclamation of land resources. It causes deterioration of the land fund quality [7, p. 149–150]. Land is the main asset in agriculture and a key element of production potential of farming enterprises [10, p. 80]. However, position of farming enterprises in the organizational system of agrarian production directly depends on the possibility to become a participant of market transactions concerning land parcels. In that aspect, development of lease relations, being capable to supply necessary resource parameters of economic subjects, particularly concerning land, is a crucial factor [9, p. 14].
Creation of production potential of farming enterprises is a complicated and continuous process, which expects a balanced and proportional combination of the required labor, land and material resources [5, p. 97]. Thus, land supply is a factor, which determines other resources, on one hand, and a result of production factors interaction, on the other hand.
The mentioned issues confirm timeliness of the topic of the research. It needs substantiation of scientific and practical approaches concerning land use of farming enterprises in Ukraine to secure their competitive advantage.

MATERIALS AND METHODS

Methodological basis of the research includes

a set of methods of scientific cognition. A complex application of the methods enables formation of theoretical and applied aspects of improvement of the system of land use and landholding of farming enterprises. Particularly, among the used method there are: the system method – to assess conditions of land use of farming enterprises; analysis and synthesis – to determine tendencies in change of the indicators of efficient use of land, as an element of production potential and generalization of the tendencies of land use by farming enterprises of different sizes with consideration of a regional feature; the method of grouping – to make a differentiating distribution of faming enterprises by the feature of land use; correlation method – to examine impact of the average size of land use on financial result of farming enterprises; graphical method – to supply visual depiction of materials.

RESULTS AND DISCUSSIONS

The problem of production potential formation is of particular importance for new-established farming enterprises in Ukraine, that is caused by a set of reasons and conditions. First, it is a limit of lands, particularly area of reserve lands, which are to be supplied to the people, who wish to start their private agrarian business. Thus, area of land use is a limiting factor for farming enterprises and sometimes it results in their inefficient performance [11, p. 23]. However, there is an urgent need to study the tendencies of land supply for farming enterprises, particularly in the Carpathian region, which possesses small area.

One should note that in the Carpathian region and in Ukraine generally, there is a tendency to increase of the area of agricultural lands and arable lands, employed by farming enterprises [4, p. 34–35]. In 2010–2017, in Ukraine, area of agricultural lands, used by the farmers, increased by 289.3 thousand hectare, and in the Carpathian region – by 15.8 thousand hectare [5, p. 67; 10, p. 128]. Area of farmers' lands expands by consolidation of farmers and by lease of land parcels. It is remarkable that farmers attract large area of agricultural lands on the base of lease. A high degree of land plowing by farming enterprises confirms specialization of domestic farming in crop production and demonstrates disproportion of the branch structure. Particularly, in 2017, the share of arable lands in the total area of agricultural lands, used by farmers in the Carpathian region, constituted 9.6 %, and in Ukraine – 97.3 % [5, p. 128].

Land use is not just an important criterion of farming enterprises performance, but the principal factor for determining of their size. On one hand, size of an enterprise is a measuring indicator of the enterprise efficiency, and, on the other hand, it is a result of the enterprise performance. Size of a farming enterprise should be set to secure rational use of the system of machines, full-time employment of workers and members of the farmer's family, as well as to achieve twice more reward per a unit of land and invested capital. Moreover, the farmer should get profit from application of modern technologies. Thus, it is very important to study sizes of farming enterprises according to the factor of their land use in order to determine their capabilities and results of production potential reproduction.

Domestic and world practice has a wide system of natural and cost indicators concerning assessment of enterprises sizes. In is worth mentioning that in the countries of the European Union, assessment of sizes is performed referring to the indicator of an "economic size of a farm" [1, p. 30]. In the USA, farms with the sales volume under 40 thousand USD annually are considered non-commercial, because they do not provide full-time employment of the farmer. In Germany, a minimum size of a farm should secure full-time employment for two people all year round and their earnings should be at the same level as industrial employees earn [3, p. 163]. In Lithuania, a land parcel of 10–50 ha is appropriate for a farm performance.

According to the criterion of land area per one farm, the Carpathian region is far below the average indicator in Ukraine. Thus, the average size of a farming enterprise in

Ukraine in 2017 reached the mark of 130.5 ha, that was by 70.4 ha above the level of 2000, and farming enterprises in the Carpathian region – 43.7 ha. According to the feature of land use in 2017, the average size of farming enterprises in the Carpathian region was three times less, as compared to the average figure in Ukraine [8, p. 172; 5, p. 131]. One should note that farmers often give preferences to making agreements of lease for a longer period, particularly from six to ten years, or even above ten-year term. Farming enterprises with the average area of land use of 100 ha exceed the size of the similar model in the European countries. They constitute the economic basis for formation of the middle class of owners in a village [13, p. 34].

The correlation dependence of a net financial result per one farming enterprise on the average size of farming enterprises demonstrates a liner dependence (Fig 1). To define some regularities, farming enterprises in Ukraine are grouped into 31 categories (from 0 to above 2,000 ha of arable lands per one farm), according to the area of arable lands.

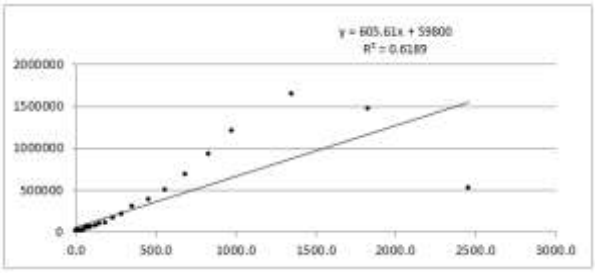

Fig. 1. Dependence of financial result per one farm on the average size of land use by farming enterprises, 2017.

Source: calculated and designed, basing on the information of the State Statistics Service of Ukraine (form 2-farms)

The obtained results confirm relations between the indicators. However, the relations are not close enough (correlation ratio equals 0.62). It suggests that larger farming enterprises get more profit of their performance, while 62 % of profit per one farm depends of the size of its landholding, and 38 % – on other factors.

The linear dependence is destroyed by the obvious fact, observed at the Figure. It demonstrates that level of financial results of farming enterprises of above 2,000 ha of area is actually equal to the indicator of the farms with the average size of land use, i.e. 500 ha. To explain the tendency, it is necessary to refer to primary data. The authors of the work note that the groups of large enterprises (above 1,250 ha of arable lands per one enterprise) include a great number of so-called formal farms, which are either registered for some false people, or submit land to sub-lease. Thus, possessing but not using the land, they cause disagreements, which influence the total indicator of the groups of farming enterprises.

It is worth mentioning that in the Carpathian region there is deficiency of lands. Thus, market turnover of lands should be started with total inventory of all land resources. Performance of such audit provides an actual picture of agricultural land use in terms of landholders and land-users, relating to each land parcel on the territory of a definite administrative-territorial unit. Such state initiatives can contribute to the maximum focus of farming enterprises on economic employment of those free land parcels. However, according to the introduced monitoring, the inspection is made on the lands of state ownership, which are not used. Thus, local authorities initiate to take those free land parcels to the auction for sale of lease right. Finally, establishment of a new farming enterprise or expanding of the existing one can be fulfilled only through land purchase. However, a farmer will also face some tax load along with the cost of land purchase, due to such transaction. Nowadays, to establish a farming enterprise one should have a considerable seed capital. Moreover, such course of actions can have negative effects if the purchase and registration of land is done by power familiar people using dummy names. Thus, an optimal way to regulate such situation is to support the further development of farming, particularly legal adoption of a maximum size of a land parcel for running of a farming business.

In Ukraine, sizes of farming enterprises variate considerably. In 2017, the largest

share (3.4 %) was taken by the farms with the sizes of land area from 20 to 50 ha, but they possessed only 8.7 % of agricultural lands. Small farms, i.e. the farms under 20 ha, constituted only 29.1 % and employed 1.9 % of agricultural lands [12, p. 173]. One can conclude that farming enterprises try to expand their land area. It will secure more effective use of the productive potential. Disintegration of the structure of land use and misbalance of the market of agricultural products have caused a substantial distortion of the structure of their production [6; p. 35]. Monopolization of sales channels by large agricultural enterprises causes loss of profitable positions by farms. Sales schemes for most kinds of agricultural product, which would consider interests of small-goods enterprises, are not developed, particularly concerning wholesaling of fresh products [2, p. 8].

Contrary to the distribution of farming enterprises by sizes generally in Ukraine, where one observes the tendency to consolidation, farming enterprises in the Carpathian region are still of smaller sizes, but number of the small farms exceeds the number of even medium-size ones. Particularly in 2017, in the Carpathian region there were almost 70 % of farming enterprises with land area under 50 ha. However, such great number of farming enterprises is sometimes inconsistent with the share of land. Thus, in 2017, the mentioned aggregate of small farming enterprises cultivated approximately 17.1 % of agricultural lands. It stresses the scale of land use by larger farming enterprises. Small area of lands use should produce the situation when farming in the Carpathian region is in avant-garde of development of family-farming traditions.

However, the picture concerning examination of the average sizes of farming enterprises will be not complete, and the situation will be not clear without consideration of the phenomenon in dynamics (Fig. 2).

The presented histogram vividly demonstrates reduction of the number of farming enterprises in the groups with less land use, and increase of the number of enterprises of medium and large land use. Following the goal of family farming development on the example of the best European samples, the radical reduction of the number of farming enterprises in the groups up to 10 ha, as well as in the group from 10 to 20 and from 20 to 50 ha of agricultural lands, raises fears. Farming enterprises of such sizes could be a fundamental of the national farming, could develop traditions of unique supply of agricultural products, particularly of animal origin. It is obvious that family farms can hardly meet competition with large farming enterprises. Thus, the state should focus additional regulators concerning protection of small agricultural producers. It enables increase of the total number of farming enterprises, rise their level of competitive capacity, intensify social responsibility of such kind of agrarian business.

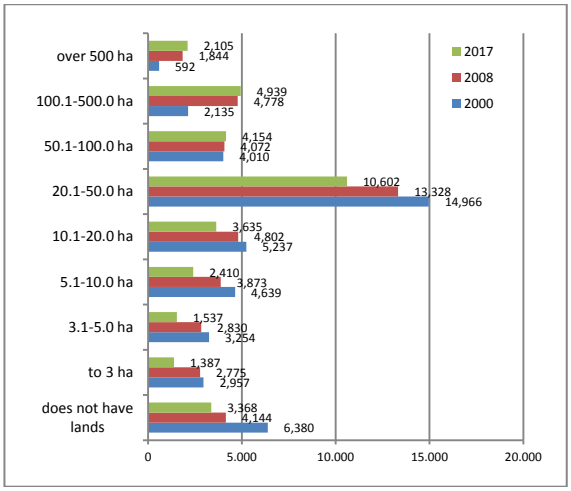

Fig. 2. Transformation of farming enterprises distribution according to the area of agricultural lands, unit

Source: [8, p. 138; 12, p. 173]

There are no established land relations, and eventually negative results of operation activity of farming enterprises can deteriorate image of farming as a particular form of economic activity in a village. It often happens that, having lost any expectation of just land relations and results of farms' performance, peasants initiate the processes of giving their land back to leasing holders. It mostly forces reduction of the number of farming enterprises. Other farming enterprises

make new agreements concerning the released land and thus, they expand their land use.

However, in the market environment, it is not always reasonable to state that efficiency of agricultural activity is an exclusive function of a farm size. Nowadays, there are many examples, which confirm that "small formats can create great things, i.e. perform quite efficiently, basing on the available level of production potential. It is clear that solution of the problem of land use of farming enterprises needs a differentiated approach, which should first determine all aspects of productive and commercial activity of small and medium-size enterprises.

It is the fact that small farms are more competitive from the position of response to changes of the market conjuncture. They can faster adapt to the changes in financial and pricing policy of the state, more efficiently react to the needs in management of productive and sales processes. However, small family farms do not secure efficient use of machinery, particularly in crop production, because the effect of a large-scale production is not achieved. There are also high risks of agricultural activity, which are caused by unexpected weather conditions. In combination with the small scales of production, the risks make difficulties in the system of crediting. Small-goods production does not always guaranty that the farmer and his/her family get the size of income, which is equal to their expenditures. Moreover, small family farms are incapable to solve food problems in the national terms. They are not quite efficient a priory, because small land area and livestock do not expect total use of the findings of science and technics.

Thus, theory and practice give a clear substantiation that the best results of operation are particular for the large farming enterprises. However, it should not be accepted as an axiom, because efficiency of anything depends on many subjective and objective factors. It is worth mentioning that in the countries of the Western Europe, farms with the area of 20–50 ha are considered the most efficient ones. Procedure of modification of the established regularities and traditions of farming in foreign countries is not always reasonable under the national realities. Nevertheless, the social focus in land relations is always actual, because the issue of farming in Ukraine has transferred from the economic sphere to the social one. It is particularly true for inheritance and gifting of land parcels as an instrument and opportunity of a continuous performance of farming organization.

Under Ukrainian conditions, sizes of farming enterprises immediately depend of land possession by rural residents, while it is different in different regions. One should note that in terms of regions, sizes of land shares, owned by peasants, are radically different. For instance, in the Carpathian region, the average size of land parcels does not exceed 1.5 ha. It demonstrates a high degree of parceling of agricultural land area in the region. In contrast, peasants of the southern regions of Ukraine have got land parcels of 12–14 ha as a result of land parceling. However, possessing such precious resource, peasants do not always wish to run their personal small business, i.e. they do not start their individual business in a village. The reasons of such situation include inappropriate national legislature, absolute power of controlling authorities, enslaving credit terms of banks, etc.

Nowadays, the problem of establishment of the appropriate land market in Ukraine faces numerous warnings and speculations concerning possible consequences of the process. Small producers have fears that most of the sold lands will be owned by agroholdings, i.e. automatically possessed by foreigners. Scientists consider the market of agricultural land through the village-protective paradigm. To their mind, lifting of the moratorium on sale of agricultural land should contribute to gradual transformation of small households into family farms [14, p. 96]. Thus, the land market should perform only for the sake of farmers and small landholders. Farming is crisis-resistant, and totally meets the interests of villages and peasants, as it has total territorial and social

adaptation to rural realities, particularly family farming [14, p. 92].

The Fig. 3 demonstrates a developed mechanism for implementation of the system of land use and land possession.

Regardless of the adopted changes, the laws do not describe a clear procedure as to obtaining of land parcels for starting of family farming enterprises.

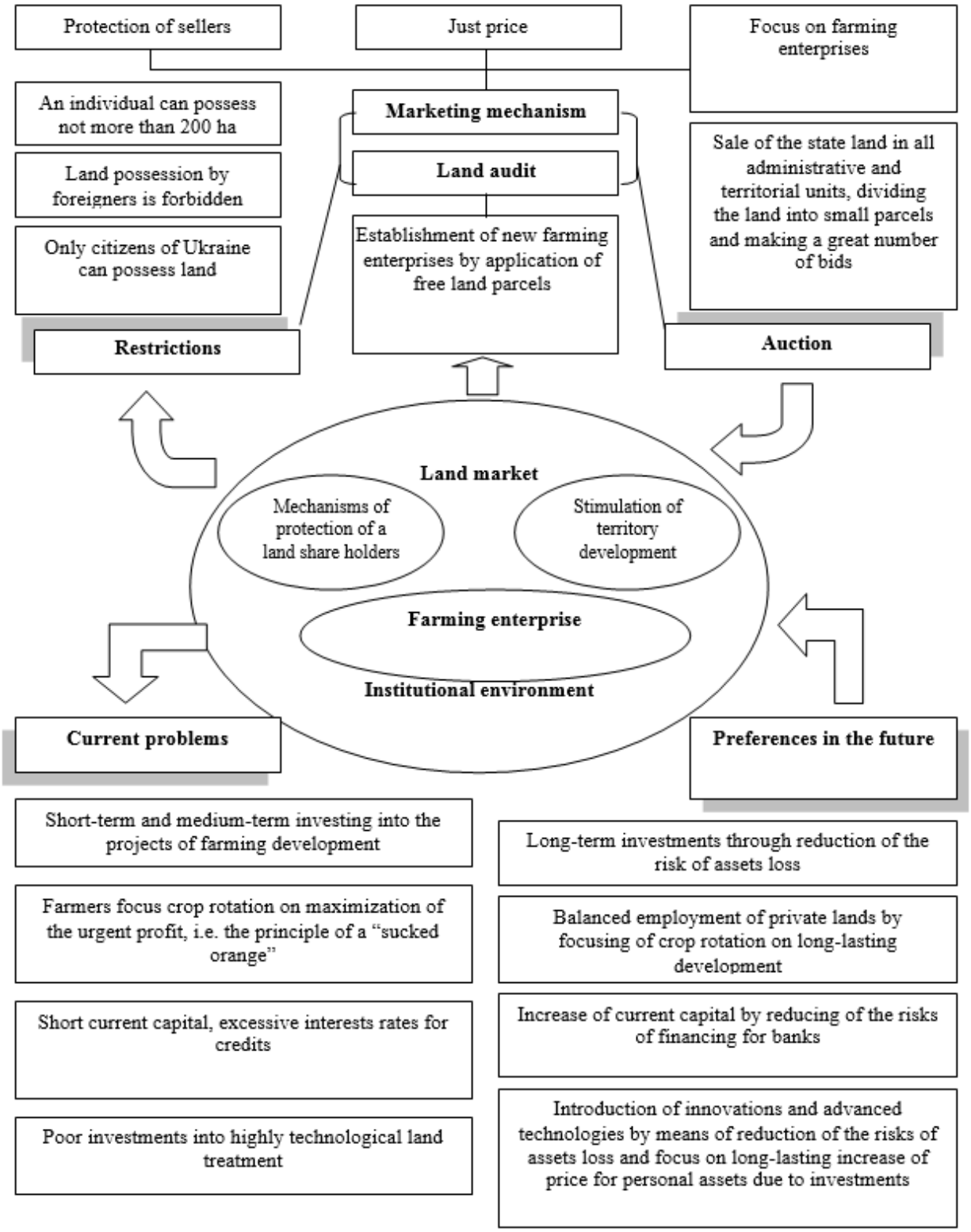

Fig. 3. Transformation of the paradigm of the system of land use and landholding in favor of farming enterprises
Source: own concept.

It is obvious that if a farm is of a family type and the status defines some preferences, it should expect a simplified procedure of creation of the enterprise's land fund. Thus, the land parcels, detected by the audit, should be first directed at establishment of new farming enterprises. The order, proposed by the authors of the article, expects directing of the land parcels to the people, wishing to establish a farming enterprise not by means of an auction, but through immediate obtaining according to the resolution of local authorities on the base of land contests. Winners of the land contests should be named not according to the money criterion, but considering conditions of the land parcel use and consistency of the future farm performance.
Ukraine should define its priorities concerning what is primary, either highly efficient production or well-being of peasants. Unfortunately, combination of the two goals is be always possible. Thus, farming can be a factor for achievement of a multi-effect of the goals, i.e. security of food safety on the base of efficient economic activity and rise of social standards on rural territory.

CONCLUSIONS

In the system of landholding and land use, there is a clear tendency to consolidation of farming enterprises. The work argues the timeliness of the problem of establishment of new farms because of limited land area. Thus, farming enterprises of the Carpathian region still have rather small sizes of land use, while the number of small farms is large. Redistribution of farming enterprises in the direction to increase of the number of large enterprises, which operate as large-scale producers, contradicts with the tendencies, caused by land reforms in the countries of Europe. Support for development of family farming, which eventually demonstrates higher indicators of efficiency of land use and ecological load on land (a lower degree of plowing), will contribute to arrangement of the branch structure and secure sustainable agricultural land use.

The tendency to consolidation of farming enterprises, actualization of the problem of establishment of new farms by limiting of land area, not properly regulated transfer of agricultural lands, and driving of farmers out of land market have caused transformation of the paradigm of land use and landholding. Its target function is focused on the interests of farmers and small landholders. The model of land market, which is suitable for farmers, should be developed on the fundamentals of uncompromising adequate correlation of family farming and corporative-latifundia types of farming. It requires an adapted procedure to detect unemployed lands and supply the lands for those people, who wish to establish a farming enterprise through land contests, forcing development of village-protective models of agrarian organization.

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COMPETITIVE ADVANTAGES OF FARMING ENTERPRISES IN UKRAINE: A METHODIC APPROACH TO DIAGNOSTICS OF THE ADDED VALUE OF PRODUCTS

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Abstract

The research sets the aim to argue theoretical fundamentals and outline the methods to make diagnostics of the added value of products, produced by farming enterprises. To determine reserves for improvement of competitive advantages of farming enterprises the work proposes to use an analytical instrument, called a "value chain". The instrument helps to interpret production potential as a basis for the chain of values, which creates the added value. Applying the instrument, the research suggests that the structural indicators of the added value of farming enterprises demonstrate distortions, which are manifested in neutralization of a socially important element, i.e. labor payment, and in prevailing of a commercial constituent, i.e. profit. It is forced by inappropriate branch structure of large agricultural enterprises. Consequently, efficiency of the added value according to its reproductive capacity is higher at large farming enterprises, and according to the social focus – at family farms. It means that large farming enterprises have better reproductive capabilities and higher competitive advantages. At family farming enterprises of Ukraine, the added value can be increased and competitive advantage can be improved by means of valorization of their products basing on innovative activity. Such approach secures production focus on narrow markets and on specific needs of some individuals. It also creates preconditions for modernization, economic growth and improvement of competitive capacity of farming enterprises.

Key words*: farms, competitive advantage, benefit, value chain.*

INTRODUCTION

For most farming enterprises, it is reasonable to organize processing and sales of their products by themselves. In other words, they should bring valorization of the ready products to the conditions, which secure a higher degree of competitive capacity [2, p. 263-264]. Supply of the products with higher added value is a specific direction both to improve competitive capacity, and to reproduce production potential of farming enterprises with small land area [4, p. 278]. In that case, farming enterprises can dictate purchase prices, amounts of supplied products, delivery terms, standards, etc. Then, most of the total profit, which is got at all stages of production process, will stay at the farms. Thus, while creating added value and determining perspective directions of the process, it is important to use the conception of the "chain of value creation", as an analytical instrument of the diagnostics of competitive advantages of farming enterprises. The conception is proposed by Michael Porter for deeper understanding of the processes, which happen inside an enterprise [5, p. 178-179].

Considering the mentioned problems of farming enterprises performance in Ukraine, one should note that supply of unique products with a high added value is the precondition for competitive advantages of the enterprises. Farming enterprises are interested to study the issue of added value concerning possible higher benefits of their products sales, and thus, more earnings.

Everything mentioned above argues timeliness of the research topic and requires development of scientific and methodic approaches concerning diagnostics of the added value of products in order to find out

reserves for improvement of competitive advantages of farming enterprises.

MATERIALS AND METHODS

Among the methods of scientific cognition, used for specification of the methodic aspects of diagnostics of the added value of products, as the instrument for detection of competitive advantages of farming enterprises, the research considered the following ones, particularly, a structural-logical method – to create the added value in the value chain and to model relations, developed between structural indicators of the added value of farming enterprises; method of grouping – to make differentiating distribution of farming enterprises according to the criterion of land use in order to examine tendencies concerning indices of the added value at Ukrainian farming enterprises; economic diagnostics – for assessment of creation and use of products added value at farming enterprises; monographic method – for examining of peculiarities concerning creation of added value in the products' values chains, using the example of a definite farming enterprise, i.e. cheese factory; graphic method – for visual presentation of the research results.

The key element of the present research, particularly the added value indicator *(AV)*, expects the following constituents, i.e. depreciation of capital assets *(D)*, salary of employees *(SE)*, profit *(P)* and specific charges *(C_s)*. In the research, it means payment for land lease.

Added value of products is calculated by the formula:

$$AV = D + SE + P + C_s$$

RESULTS AND DISCUSSIONS

The value chain of a farming enterprise is a process aiming to creation the values of a product, a set of the economic activities, which is often outside the internal production, and includes a total of material and non-material expenditures, which create the principal and added values. The Porter's chain or the chain of values (Value Chain) is a modern effective instrument to assess competitive capacity at micro and meso levels, as well as an instrument to find out potential sources for creation of higher values for consumers [6, p. 2]. Scientists affirm that, for the last fifty years, number of transitive stages in the value chains has considerably transformed the global economy character and substantially influenced countries of the world [3, p. 70]. Supermarkets try to control the full process of production, starting from growing and gathering of agricultural products, to meet the standards of food products quality during the full value chain. The theory of logistic chains confirm that the one, who manages the chain, dictates proportions of the added value distribution between the chain links [1, p. 362].

A competitive advantage is defined as a benefit, which a consumer obtains (better quality, lower price), or a way the benefit is obtained (higher qualification of personnel). Consumers are interested in an opportunity to buy products of good quality at a rational, the lowest possible, price.

Thus, added value is an internal resource of a farming enterprise and a precious analytical indicator for the diagnostics of competitive advantages of an individual enterprise and groups of them according to size factors of their land use. The feature is concerned in the current research. Concerning farming enterprises, the added value performs such key functions, as social and commercial ones. Added value is expected in the amount, being sufficient to pay staff for creation of the value and to secure reproduction. One should note that the added value index, which maximum concerns economic interests of farming enterprises in the context of their competitive advantages, is not used in assessment of economic activity of those subjects of agrarian business. Traditionally, profit is a principal indicator for assessment of farming enterprises efficiency at micro and macro levels.

Scientific works give numerous interpretations and definitions of the studied notion, mainly multi-faceted ones.

Particularly, a relation of new-created value with its material carrier, i.e. definite kind of product or commodity, is a peculiarity of the added value, taken from the position of accounting. Current interpretations of the added value have come to the conclusion that it is the value of a sold product, minus cost of materials, which have been bought and used for its production [7]. It means that added value is a share of earnings, which consists of salary, lease payment, bank interests, depreciation cost and profit. A slightly different approach to interpretation of the nature of added value is supplied in the business dictionary. It says that it is the value, which is created in the process of production at an enterprise and depicts its actual contribution into creation of some products value [8]. It is the determined difference between the value of agricultural products, produced by a farming enterprise, and the value, which is created by other producers in the previous cycles of production. Thus, the authors of the article consider that rise of the competitive advantage of farming enterprises should be focused on valorization of high quality food products.

Added value is a multi-functional indicator and it should be used in the current research. Logics of the scientific research confirms consistency of the diagnostics of added value, which is at the stage of its creation, and while using he products. The list of indicators used to assess the added value at farming enterprises include those, which are relevant for the purpose, particularly a share of the added value of products, produced by farming enterprises, and the degree of reproductive profitability of those products.

It is a known fact that farms with small land area supply small output of agricultural products. It results in a lower profitability of their performance. However, the main motivation of farmer's work is even not to obtain a profit, but to keep his/her family. That goal is of much higher responsibility. Thus, the small amount of products, proposed by a small farmer at the market, should be competitive and have higher added value.

Traditional approach to the added value defines that it can be increased by agricultural products processing with the use of production infrastructure, particularly conservation, packaging, sorting, etc. However, each stage of the technological process, except for increase of the added value, requires larger material expenditures, which, somehow, neutralize effect of the increased share of the added value. Moreover, organization of production infrastructure requires capital investments, while farmers feel lack of cost. Thus, farming enterprises can increase their added value supplying the market with the products of unique characteristics, but the least material expenditures. Such characteristics first include natural, fresh qualities of the products, high food qualities or possess the features of a niche business. At the markets of affluent consumers, such products are very popular, particularly if it is possible to keep them fresh and natural for a longer period. Primary importance of a value chain is to supply those qualities and advantages for a consumer. Thus, a farming enterprise, which performs according to the rule "just in time" in the process of agricultural production, packaging and shipping of the product, actually adds to the value of its products in the consumers' mind. For a farmer with a low level of material and technical resources, it is a winning variant, because introduction of such order can secure reproduction of production potential without expenditures.

The share of added value in products output suggests an objective assessment of the level of vertical integration at the farming enterprises of different sizes. Figures of the proposed indicators are determined both percentagewise and in ratios, and stay within the range from 0 to 1, where 1 is a maximum possible level of vertical integration at a micro level. In contrast, the added value profitability points which share is taken by a profit. Fig. 1 demonstrates that diagrams of the studied indicators are placed and turned in the direction of medium-size and large farming enterprises, i.e. employing from 20 to 500 ha and more. It means that large farming

enterprises, which gradually obtain the features of a corporative sector, demonstrate a commercial focus of their agricultural business, i.e. they operate with the continuous efforts to maximize their profit.

Thus, the groups of medium-size and large farming enterprises mainly consider the added value as a profit.

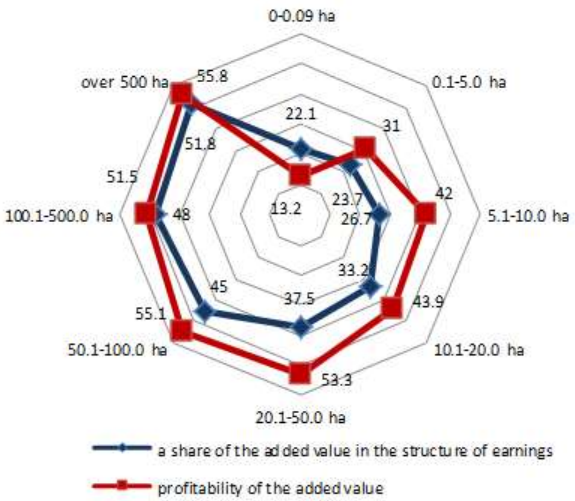


Fig. 1. Structural indicators of the added value of products, produced by farming enterprises of Ukraine, grouped referring to the criterion to the area of arable land in 2017, %

Source: calculated and designed with consideration of the information supplied by the State Statistics Service of Ukraine (form 2-farms).

Moreover, they often identify the two notions. In contrast, for a self-employed farmer, labor profit is the most important factor. In their structure of added value, the share of profit is much smaller, i. e. from 13.2 % at micro farms to 42.0 % at family farms. In that case, it is important for large and small farming enterprises to cooperate within one rural community. It is a good example of not only partner relations, but of consolidated efforts to develop rural territories. Large and small farming enterprises can amalgamate into cooperatives, for example of meat specialization. Under support of the state and local authorities, the cooperatives can build production facilities, where farmers, which are members of the cooperative, can use the facilities of meat parceling and vacuum packaging, etc.

Level of reproductive profitability of the added value of products, produced by farming enterprises, confirms a potential to the value increase. It also shows efficiency of use of production potential for reproduction. The level of reproductive profitability can also belong to the group of competitive capacity indicators. It determines amount of the added value per a unit of expenditures for production of products and services, supplied by farming enterprises. The indicator of reproductive profitability of the products of farming enterprises usually demonstrates a higher figure than the indicators of products profitability.

Thus, Fig. 2 demonstrates that the level of the indicator is higher at farming enterprises with the area of above 500 ha. Large farming enterprises have better reproductive capabilities due to prevailing of a commercial factor (profit) in the added value configuration.

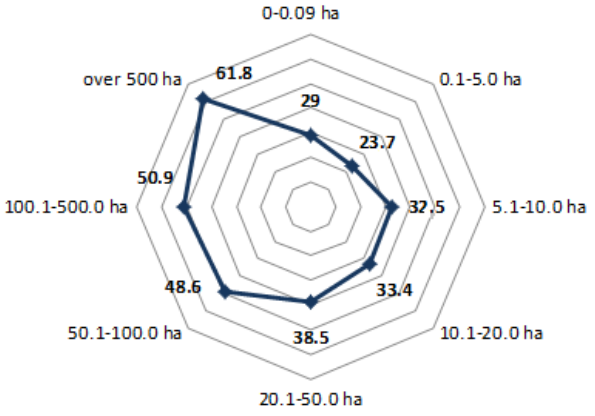


Fig. 2. Level of reproductive profitability of the added value of products of farming enterprises in Ukraine, grouped according to the employed area of arable lands in 2017, %.

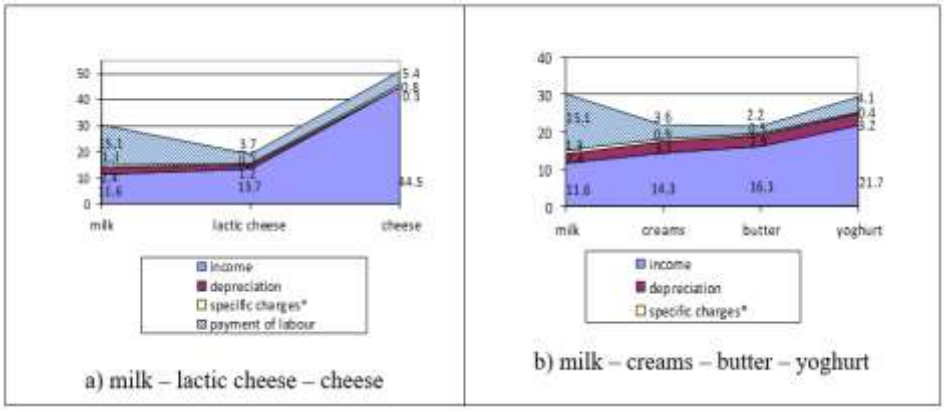
Source: calculated and designed, basing on the information, supplied by the State Statistics Service of Ukraine (form 2-farms).

The following calculations confirm that the level of labor consumption (i.e. a relation of the figure of labor payment to the added value size) vividly demonstrates a prevailing position of a social vector of the added value at small farming enterprises, employing under 50 ha of arable lands. Thus, large farming enterprises have a better capability to generate higher added value, usually due to maximization of profit. That capability is a particular feature of productive potential, and, along with its resource element, it secures a

higher level of competitive capacity of products and a sufficient progress of the reproductive process of material and technical component of productive potential. In contrast, a human factor of large farming enterprises has almost no chance for reproduction.

Thus, the process of the added value creation for products, produced by faming enterprises with an adequate correlation of social and commercial constituents, requires a controlled and regulated process of valorization, carried out with the use of appropriate innovative technologies and attraction of productive infrastructure, particularly sales area, storage premises, packaging lines, refrigerators, etc. Innovations, e.g. energy-saving technologies, make great contribution to increase of the added value due more stages of agricultural products processing, and vice versa, by minimizing of them.

The added value diagnostics in the chain of values of dairy products is considered from the position of transformation of material expenditures and intermediate products into the products of ultimate consumption. Fig. 3 demonstrates that at a definite technological point (concerning milk processing), one observes separation into several kinds of products. Then, each kind of dairy products is promoted to the market, creating personal chain of values. In the current research, the mentioned direction enables identification of the kinds of dairy products. Added value of those products helps controlling and coordinating of a competitive advantage. Increased cost of energy carriers, materials and services for animal breeding, are the reasons of less profit at the stage of milk production at a farming enterprise. In dairy products, commercial vector of the added value is increased by supplying unique competitive qualities to ultimate products, particularly cheese. Vertical integration and personal retailing secure one of the principal factors for the added value creation, i.e. food freshness.



*for milk, payment for lease of land shares is a specific expenditure, and for dairy products - it is a payment for veterinary expert report.

Fig. 3. The added value creation in the value chain of dairy production at the farming enterprises "Ahrotem" and private cheese factory "Dzhersei", average for 2017, %.

Source: calculated and designed, basing on the information of the farming enterprises "Ahrotem" and private cheese factory "Dzhersei".

CONCLUSIONS

Focus of domestic agriculture on export of raw material prevents perspective development of family farming and suppresses its competitive position. Farming efficiency, in terms of rise of a competitive advantage, can be influenced by the process, focused on valorization of food products of high quality. Results of the research confirm that degree of the vertical integration and valorization of the products of family farming enterprises of Ukraine is much higher as compared to large enterprises. Level of the indicators of efficiency of the added value creation at large farming enterprises suggests that those farms have better reproductive capabilities due to prevailing of a commercial

vector in the added value configuration. Figures of the indicator of labor consumption of the added value are distributed in the way confirming a prevailing position of a social vector of the added value at family farms.

Application of vertical integration and innovative technologies suggests minimization of the number of processing stages for the products, produced by farmers, and reduction of the period of their delivery to consumers. Thus, it helps not only to achieve an adequate combination of social and commercial vectors of the added value configuration, but also to supply consumers with new ecologically clean and nutritive balanced products and goods.

ACKNOWLEDGMENTS

Recommendations concerning the diagnostics of the added value in the value chain of products are introduced at farming enterprises "Ahrotem" in Pustomyty district, Lviv region, Ukraine (Certificate № 15/03 of March 15, 2018) and "Obrii" in Slavuta District, Khmelnytskyi region, Ukraine (Certificate № 4 of April 17, 2018).

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A LINEAR PROGRAMMING APPROACH TO MINIMIZING BROILER RATION COSTS: THE CASE OF BROILER FARMS IN AL-AHSA, SAUDI ARABIA

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Abstract

The paper aims to estimate the least-cost ration of a sample of broiler farms in Al-Ahsa, Saudi Arabia. The farms were divided into three groups based on their production capacity. The linear programming technique was used to estimate the least-cost ration using the three-stage feeding system (starter, grower, and finisher). The results show that the optimal ration would save broiler farms in Al-Ahsa, on average, SAR 234,100, and their profit would increase by 47%, compared to their present situation. Furthermore, the optimal solution showed that the cost per bird would decrease by 7.3% if broiler farms adopted the recommended ration.

Key words**:** *linear programming, least-cost, poultry ration*

INTRODUCTION

The broiler industry is considered to be one of the main agricultural industries in Saudi Arabia (KSA) due to its return on investment and nutritional value. The main nutritional characteristics of chicken are that it is rich in protein and not expensive compared to other meat items in Saudi Arabia. In 2017, broiler farms in Saudi Arabia reached 917 farms with production capacity of 10,850,000,000 birds/year (Annual Agricultural Bulleting, 2017) [8]. The aggregate broiler projects in eastern province of Saudi Arabia represent 9.6% of the total KSA broiler projects, and its production capacity represents 4.9% of the total KSA production capacity. Poultry ration is very important due to its impact on the quantity and quality of produced chicken. Minimizing ration costs is important because it helps broiler farms to minimize their production costs and obtain greater return on their investment. Since feed cost represents almost 70% of total broiler variable production cost (Oladokun and Johnson, 2012) [7], this paper aims to estimate the least-cost ration of broiler farms in Saudi Arabia by focusing on the three-stage feeding system. In the three-stage feeding system, the birds are classified as starter (ages one day to three weeks, grower stage (one month), and finisher (over five weeks).

(Chen, 1973) [3] used a quadrating programming technique to estimate the least cost feed formulation for poultry. The author indicated that the quadratic programming is not efficient for the case of large problems. Miller et al., (1986) [5] used quadratic programming to estimate finishing broiler ration and stated that the savings from using the optimal ration can reach to $120 million per year. D'Alfonso et al., (1992) [4] used linear programming (LP), LP with marginal safety method, and stochastic programming (SP) to estimate the least-cost ration for poultry. The authors stated that ration obtained using the LP method was least-cost ration, and SP method produced lower ration costs compared to the LP with the marginal safety method. Al-Deseit (2009) [1] used the LP method to estimate the least-cost broiler ration for starter and finisher feed. Oladokun and Johnson (2012) [7] used the LP method to estimate the least-cost broiler ration in Nigeria. The author showed that the optimal

LP solution resulted in 9% reduction in feed costs.

This paper adds to the literature by applying the LP method to estimate least-cost ration on a sample of broiler farms in Al-Ahsa, Saudi Arabia, which are divided into three groups based on their production capacity. Also, the paper demonstrates how the optimal solution would reduce the cost of the sample of study, and how ration delivery can affect ration costs. Moreover, the paper conducts a sensitivity analysis to show which component of broiler ration has the greater price variability.

MATERIALS AND METHODS

The data is cross-sectional data that was collected from 33 broiler farms, which represent 35.9% of the total 92 broiler farms in the eastern province (Saudi Ministry of Environment, Water, and Agriculture Bulletin, 2017) [8]. The farms were classified into three groups based on their production capacity. The first group has a production capacity of less than 150,000 birds, the second category has a production capacity ranging from 150,000 to less than 300,000 birds, and the third category has a production category of more than 300,000 birds.

In order to achieve the purpose of this paper, this paper will use linear programming (LP) techniques to estimate the least-cost rations for broiler chicken in Al-Ahsa. The objective function represents the cost function of broiler rations that we aim to minimize. The model is expressed below (Al-Deseit, 2009; Almasad et al., 2011) [1, 2]:

$$\text{Minimize} \rightarrow Z = \sum C_{ij} X_j \rightarrow \quad \text{Objective Function}$$

where Z is the total ration costs, C is the feed item cost, and X is the quantity of feed used in broiler farms.

The following are the required constraints to obtain the optimal broiler's ration:

$$X_1 + X_2 + X_3 + \cdots\cdots + X_n = b_1 \rightarrow \text{Ton}$$

$$a_1 X_1 + a_1 X_2 + \cdots\cdots + a_i X_n = b_2 \rightarrow \text{Protein\%}$$

$$a_2 X_1 + a_2 X_2 + \cdots\cdots + a_i X_n = b_3 \rightarrow \text{ME/kcal kg}$$

$$a_3 X_1 + a_3 X_2 + \cdots\cdots + a_i X_n = b_4 \rightarrow \text{Fiber\%}$$

$$a_4 X_1 + a_4 X_2 + \cdots\cdots + a_i X_n = b_5 \rightarrow \text{Fat\%}$$

$$a_5 X_1 + a_5 X_2 + \cdots\cdots + a_i X_n = b_6 \rightarrow \text{Ca\%}$$

$$a_6 X_1 + a_6 X_2 + \cdots\cdots + a_i X_n = b_7 \rightarrow \text{P\%}$$

$$a_7 X_1 + a_7 X_2 + \cdots\cdots + a_i X_n = b_8 \rightarrow \text{Lysine\%}$$

$$a_8 X_1 + a_8 X_2 + \cdots\cdots + a_i X_n = b_9 \rightarrow \text{Methionine\%}$$

$$a_9 X_1 + a_9 X_2 + \cdots\cdots + a_i X_n = b_{10} \rightarrow \text{Methionine+Cysteine\%}$$

*a is t*echnical coefficients of nutrient components as suggested by the National Research Council (1994) [6] and b is ration constraints. The model constraints provide the bird with the necessary protein, vitamins, antioxidants, etc. that are necessary for bird growth and health.

RESULTS AND DISCUSSIONS

The determinants of the objective function were obtained from the questionnaire of broiler farms in Al-Ahsa. Table 1 shows broiler feeding requirements based on the three-stage feeding system according to the information we obtained from the sample of study.

Table 1. Broiler feeding requirements based on the three-stage feeding system

Item	Constraints	Feeding Requirements		
		Starter	Grower	Finisher
Raw Protein	=	23.00	21.00	19.00
Energy (kilo calorie/kg)	=	3100	3100	3200
Dietary fiber	≤	2.430	2.410	2.310
Fats	≤	5.050	5.450	5.650
Calcium	=	1.000	0.900	0.850
Phosphorus	≥	0.500	0.450	0.450
Lysine	≥	1.380	1.200	1.100
Methionine	≥	0.550	0.540	0.510
Weight in kg	=	988.0	988.0	988.0

Source: Obtained from the sample of study.

On the other hand, the solution of the LP, as shown in Table 2 and Table 3, show that the fat percentage in Table 1 exceeds bird nutrients requirements.

Table 2. Determinants of broiler feeding requirements based on LP solution

Item	Starter	Grower	Finisher
Raw Protein	23.00	21.00	19.00
Energy (kilo calorie/kg)	3100	3100	3200
Dietary fiber	2.430	2.410	2.310
Fats	4.730	4.250	5.290
Calcium	1.000	0.900	0.850
Phosphorus	0.500	0.450	0.450
Lysine	1.380	1.200	1.100
Methionine	0.550	0.540	0.510
Weight in kg	988.0	988.0	988.0

Source: Own results.

The growth rate was by approximately 0.32%, 1.2%, and 0.36% higher for starter, grower, and finisher stages, respectively. However, the remaining feeding items matched the LP optimal solution.

Table 3. Minimum and maximum feeding requirements based on the LP solution

Item	Starter		Grower		Finisher	
	Min	Max	Min	Max	Min	Max
Raw Protein	23.00	0.000	21.00	0.000	19.00	0.000
Energy (kilo calorie/kg)	0.000	3100	0.000	3100	0.000	3200
Dietary fiber	0.000	2.430	0.000	2.410	0.000	2.310
Fats	0.000	4.730	0.000	4.250	0.000	5.290
Calcium	0.000	1.000	0.000	0.900	0.000	0.850
Phosphorus	0.000	0.500	0.000	0.450	0.000	0.450
Lysine	0.000	1.380	0.000	1.200	0.000	1.100
Methionine	0.000	0.550	0.000	0.540	0.000	0.510

Source: Own results.

Tables 4, 5, and 6 show components and costs of broiler chicken optimal ration for starter, grower, and finisher, respectively. The tables show that the total costs for optimal rations are SAR 1359, SAR 1287, and SAR 1313 for starter, grower, and finisher, respectively. Thus, the most expensive feeding stage is the starter and the least expensive stage is the grower. We can also see that the optimal ration shows that maize has the greatest percentage in broiler ration in all development stages. As a result, maize's total cost represents 30%, 35%, and 36% of the total cost in starter stage, grower stage, and finisher stage, respectively.

Table 4. Optimal ration components for starter stage

Ration Component	Quantity (KG)	% Ton	Actual Price	Cost
Maize	582.4	58.24	0.7	407.68
Soybean	269.4	26.94	1.15	309.81
Maize Gluten	75.50	7.550	2.063	155.76
Vegetable oil	21.00	2.100	5.000	105.00
Methionine	1.500	0.150	35.00	52.500
Lysine	3.500	0.350	21.00	73.500
Monocalcium Phosphate	18.30	1.830	1.50	27.45
Limestone	16.40	1.640	0.075	1.2300
Vitamins and Minerals	4.000	0.400	24.00	96.000
Premix	1.000	0.100	20.00	20.000
Anticoccidials	0.500	0.050	100.0	50.000
Antifungal	2.000	0.200	30.00	60.000
Sodium Chloride Salt	4.500	0.450	0.300	1.4000
Total	1,000	100.0	-	1,358.93

Source: Collected and calculated from LP solution using 2019 market prices.

Table 5. Optimal ration components for grower stage

Ration Component	Quantity (KG)	% Ton	Actual Price	Cost
Maize	639.7	63.97	0.7	447
Soybean	236.5	23.65	1.15	271.98
Maize Gluten	61.70	6.170	2.063	127.87
Vegetable oil	14.60	1.460	5.000	73.000
Methionine	1.700	0.170	35.00	59.500
Lysine	2.700	0.270	21.00	56.700
Monocalcium Phosphate	16.10	1.610	1.50	24.150
Limestone	14.90	1.490	0.075	1.1180
Vitamins and Minerals	4.000	0.400	24.00	96.000
Premix	1.000	0.100	20.00	20.000
Anticoccidials	0.500	0.050	100.0	50.000
Antifungal	2.000	0.200	30.00	60.000
Sodium Chloride Salt	4.500	0.450	0.300	1.4000
Total	1,000	100.0	-	1,287.32

Source: Collected and calculated from LP solution using 2019 market prices.

Table 6. Optimal ration components for finisher stage

Ration Component	Quantity (KG)	% Ton	Actual Price	Cost
Maize	679.0	67.9	0.7	475.3
Soybean	189.0	18.9	1.15	217.35
Maize Gluten	61.00	6.10	2.063	125.84
Vegetable oil	24.10	2.41	5.000	120.50
Methionine	1.700	0.17	35.00	59.500
Lysine	3.000	0.30	21.00	63.000
Monocalcium Phosphate	16.50	1.65	1.5	24.75
Limestone	13.70	1.37	0.075	1.0300
Vitamins and Minerals	4.000	0.400	24.00	96.000
Premix	1.000	0.100	20.00	20.000
Anticoccidials	0.500	0.050	100.0	50.000
Antifungal	2.000	0.200	30.00	60.000
Sodium Chloride Salt	4.500	0.450	0.300	1.4000
Total	1,000	100.0	-	1,313.27

Source: Collected and calculated from LP solution using 2019 market prices.

According to Tables 4, 5, and 6 the average ration cost per ton, if it was made in the farm, is SAR 1320. Table 7 shows the average ration cost per ton according to the sample of study. Table 7 also shows the cost based on the broiler farm production capacity, as stated earlier in the paper. We can see that the average cost per ton when ration is delivery to the farm gate is SAR 1700, and the average cost per ton when the ration is obtained directly from the manufacturer is SAR 1570. Consequently, there is SAR 130 profit in every ton that goes to a third party, such as a delivery company or courier. Thus, we can see that the broiler farms in Al-Ahsa would save, on average, SAR 380 and SAR 250 if they mix the optimal ration ingredients in their farms compared to farm gate deliveries

and direct receiving from factories, respectively.

Table 7. Average ration cost per ton according the sample of study

Delivery type	Average cost per ton according to production capacity			Average Cost
	First group less than 150,000 bird	Second Group 150,000-300,000 birds	Third Group over 300,000 birds	
Farm Gate	1,809	1,707	1,583	1,700
Receives from factory	1,633	1,569	1,507	1,570
Third party profit	176	138	76	130

Source: Own results.

We then conducted a sensitivity analysis to reveal the sensitivity of the components of broiler rations based on changes in market prices. This helps us to know which item in the ration has greatest price volatility and which item has the least price volatility.
Table 8 shows the results of the sensitivity analysis for ration components that are required in starter stage, grower stage, and finisher stage, respectively.

Table 8. Sensitivity analysis of ration components' prices

Optimal Ration Component	Price in SAR per kg			% Price decrease	% Price increase
	Actual	Minimum	Maximum		
Maize	0.7	0.222	1.77	68.29	152.86
Soybean	1.15	-	1.38	-	20.00
Maize Gluten	2.063	1.70	5.01	17.60	142.85
Vegetable oil	5.000	-	7.710	-	54.200
Methionine	35.00	4.720	156.4	86.51	346.86
Lysine	21.00	4.710	208.5	77.57	892.86
Monocalcium Phosphate	1.50	0.03	∞	98.00	∞
Limestone	0.075	-	9.820	-	12,993

Source: Calculated using LP solution using 2019 market prices.

Table 8 shows that soybean, vegetable oil, and limestone are not subject to any reduction in price. Monocalcium phosphate, methionine, lysine, and maize reveal the greatest percentage decrease in price. Thus, decision makers in broiler farms should utilize the reduction in these ration component prices by supplying their farm needs when prices drop and reducing the impact of future price increases. This will reduce their total cost and help them to maximize their prices during the high-price season. Furthermore, limestone, lysine, methionine, maize, and maize gluten show the largest percentage increase in price. As a result, decision makers in broiler farms should try as much as possible to mitigate the effect of price increase in these components by either purchasing a large quantity when prices drop or utilize future markets. The infinity sign (∞) attached to monocalcium phosphate indicates that there is no limit for price increase and that the component is very necessary, according to bird biological needs, regardless of any future increases in price.
Tables 9 (in appendix) shows the average cost and revenue of the study sample and Table 10 (in appendix) shows the reduction in broiler farms' costs if they adopted the suggested optimal ration. We can see that the broiler farms in Al-Ahsa would save, on average, SAR 234,100. As a result, the average broiler farms' profit would increase from SAR 494,000 to SAR 728,100, which indicates that the percentage increase in their profit is 47%. Also, the average cost per bird would decrease by 8%, which will translate to a 56% increase in profit per bird.

Table 9. Sample average cost and revenue

Production capacity	**Number of birds**	Ration quantity per ton	Ration cost per ton	Ration total cost	Average sample total cost	Average sample revenue	Average sample net profit	Cost per bird	Profit per bird
First Group	119	338.2	1,809	611.8	1,721	1,845	124.7	14.6	1.1
Second Group	234	665.7	1,707	1,136.3	3,140	3,564	423.6	13.4	1.8
Third Group	374	1,062.2	1,583	1,681.5	4,849	5,783	933.6	12.9	2.5
Average	242	688.7	1,700	1,143.2	3,237	3,731	494	13.6	1.8

Note: Birds and values are in thousands SAR.

Table 10. Saving in average sample cost after optimal ration application

Production Capacity	Number of birds	Ration quantity per ton	Ration cost per ton	Ration total cost	Reduction in ration total cost	Average sample total cost after reduction in ration cost	average sample net profit after cost reduction	Cost per bird	Profitper bird
First Group	119	338.2	1,320	446.4	165.4	1,555.6	289.4	13.1	2.4
Second Group	234	665.7	1,320	878.7	257.6	2,882.4	681.6	12.3	2.9
Third Group	374	1,062.2	1,320	1,402.1	279.4	4,569.6	1,213.4	12.2	3.2
Average	242	688.7	1,320	909.1	234.1	3,002.9	728.1	12.5	2.8

Note: Birds and values are in thousands SAR.

CONCLUSIONS

The paper uses the LP technique to estimate the optimal least-cost ration for a sample of broiler farms in Al-Ahsa, Saudi Arabia. The sample represents 35.9% of total broiler farms in the eastern province. The farms were divided based on their production capacity into three groups. The first group has a production capacity that does not exceed 150,000 birds, the second group has a production capacity of 150,000 to 300,000 birds, and the third group has a production capacity of over 300,000 birds. The paper applied the LP technique by focusing on the three-stage feeding system (i.e. starter, grower, and finisher). The results show that the most expensive feeding stage is the starter and the least expensive stage is the grower. The paper also revealed that broiler farms would save more if they mix broiler ration components inside their farms rather than buying them from third parties. Sensitivity analysis reveals that limestone, lysine, methionine, maize, and maize gluten show the largest percentage increase in price. Thus, the decision makers of broiler farms are urged to supply as much as possible of their needs from these materials during the seasons of low prices or to use future markets to mitigate the risk of price uncertainty. This paper shows that if broiler farms in Al-Ahsa adopted the recommended optimal ration mix, they would save, on average, SAR 234,100 and their profit would increase by 47%.

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ANALYSIS OF AGRICULTURAL ENTREPRENEURIAL INCOME AND ITS ROLE IN AGRICULTURE FINANCING. CASE STUDY ROMANIA

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Abstract

European Union has been and is still interested in the level of income obtained by farmers in the context in which through its specific instruments it intervenes in support of this sector. Among the objectives set by the CAP were: increasing productivity in agriculture, but also ensuring a fair standard of living for the population working in agriculture. This can be achieved by increasing the incomes of agricultural workers. Given the fact that almost one third of the EU budget is allocated either directly or indirectly to support farmers' incomes in order to ensure a fair standard of living, to understand the important role that the income obtained from agricultural activities has in the modeling of decisions. The purpose of this paper is to analyze the way in which the incomes obtained from the agricultural entrepreneurship have evolved since the accession of Romania to the European Union. Revenue fluctuations will also be analyzed in comparison with the average of the revenues recorded at EU level. The main sources of data were those currently available at EU level, namely: the economic accounts for agriculture (CEA), which is the main source of monitoring of the incomes from agriculture recorded at the macroeconomic level, as well as the data provided by RICA (Agricultural accounting information network) which *is a tool for evaluating the CAP.*

Key words**:** *entrepreneurial, income, agriculture, Romania*

INTRODUCTION

Although agriculture is a sector where productivity is lower than in other sectors of the economy, and in this area, significant progress has been made that has contributed to increasing the incomes of agricultural entrepreneurs [2]. Thus, the way of determining the income from agricultural entrepreneurship began to concern the specialists in this field, considering that new elements appear that need to be quantified so that their correct value can be established.

Starting from the fact that entrepreneurship can be defined as a process that consists of identifying and pursuing a business opportunity, in order to capitalize on it, we find that an entrepreneur must be innovative, leader, able to take risks, independently. At the same time he is creative, optimistic, results oriented, flexible materialist in conclusion he is a key element of the market economy.

In agriculture, entrepreneurship may be different from other sectors of activity due to "the particularities of the agricultural sector, namely: the history of the agricultural sector, the farm environment, the type of farm, etc". [1]. Therefore, although agricultural entrepreneurship has many of the characteristics of general entrepreneurship, it also has many features.

MATERIALS AND METHODS

The working method involved studying the specialized literature on how to determine the agricultural entrepreneurial income, as well as collecting statistical data on the evolution of the indicator in the period 2008-2017, as well as analysing and interpreting it. The agricultural entrepreneurial income is "an indicator that is used to assess the activities carried out by the entrepreneurs in this sector, rewarding the work done by the farmer, as well as the unpaid work performed by the members of his family. Thus, the agricultural

entrepreneurial income measures the income derived from the agricultural activities carried out used for the remuneration of the production factors and which is obtained by deducting the salaries, the rent and the interests from the total income" [7]. If there are family farms, they are well put into operation, farmer and family work may not be quantified so that they can be separated from other care income that can be closed. However, this income is not the total income of the farmer or the income available at the farm level, because income can also be obtained from non-agricultural activities. In other words, entrepreneurial agricultural income is represented by those income generated from the development of agricultural activities and those from other activities that cannot be separated from agricultural activities [8].

The agricultural entrepreneurial income is determined as follows as presented in Fig.1.

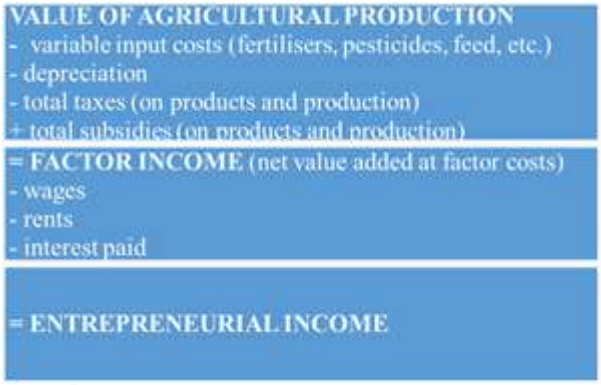

Fig. 1. Entrepreneurial income
Source: own processing [7].

In this paper, there were analyzed the following aspects: the entrepreneurial income per annual work unit in Romania and in the EU, the income per family worker in agriculture compared to the salary paid at the national economy level, the family farm income by sectors, agricultural entrepreneurial income, by size classes of agricultural farms, the value of the total subsidies, he value of decoupled payments, by activity sectors, net value added per farm. Most of the indicators were studied in the period 2008-2016.

RESULTS AND DISCUSSIONS

One of the challenges facing agriculture in the U.E. supported by the post 2020 CAP objectives is the pressure on agricultural incomes. According to the Proposal for a regulation, COM (2018) 392 final, art. 6, the specific objective 1 to be achieved is "to support viable farm incomes and resilience throughout the Union, in order to improve food security" [6].

In this paper we propose to analyze the evolution of agricultural entrepreneurial incomes in the period 2008-2016 (2016 being the last year with data processed and published by RICA), as well as of the subsidies granted during this period.

Table 1. Evolution of entrepreneurial income
Euro/annual work unit

Year	Romania	EU-27	EU/ Romania
2008	2,250.0	9,314.7	4.14
2009	1,598.1	7,889.0	4.94
2010	1,645.2	10,989.4	6.68
2011	4,322.9	12,580.6	2.91
2012	3,074.3	12,297.0	4.00
2013	3,619.2	12,937.9	3.57
2014	4,068.3	13,174.7	3.24
2015	3,983.7	12,425.6	3.12
2016	3,761.3	12,681.3	3.37
2017	3,786.0	15,433.0	4.07

Source: own processing [5].

From the analysis of the entrepreneurial income, it is found that both at the level of Romania and at the level of the U.E. there were oscillations between 2008-2017. At the level of Romania, the highest entrepreneurial revenues were obtained in 2011, when their value was 81% higher than in 2014 and 92% higher than in 2008. In 2009, the lowest value of this was recorded, the decrease being 29% compared to 2008. Comparing with the values of these revenues registered at the level of the European Union, we find that the highest incomes were registered at the level of 2017, with an increase of 42% compared to 2014 and with an increase of 66% compared to 2008. In 2010, the highest ratio of average income in Romania and the U.E. was recorded. At E.U. level, the agricultural

entrepreneurial income is about 7 times higher than the one obtained in our country.
Also at the level of 2017 the average of the revenues at the level of the U.E. it was 4 times larger than in the case of Romania.

Table 2. Evolution of the income per family worker in agriculture compared to the salary paid at the national economy level (%)

Year	Romania	UE-27	Romania/UE
2008	37,2	33,2	1.1
2009	28,5	27,5	1.04
2010	28,2	37,7	0.75
2011	82,9	42,9	1.93
2012	54,7	41,0	1.33
2013	64,4	42,9	1.50
2014	67,4	43,2	1.56
2015	65,3	39,8	1.64
2016	56,7	40,7	1.39
2017	*	*	*

Source: own processing [9].

Analyzing the share of income per family worker compared to the average salary registered at the national economy level, we find that in Romania the weights are, in general, exceeding the average U.E. This is determined by the low value of the average wage, but also by the value of the low incomes recorded at the level of agricultural activities. Since 2009 there has been an increase in family income per worker. The highest value of the income from this period was recorded in 2010, when the income obtained by the family worker was of almost 83% of the average wage in the economy. Also in 2013, 2014 and 2015, the share of these revenues deposited 60% of the value of the average wage per economy.

Table 3. Evolution of the family farm income by sectors in 2016 (Euro)

Sector	Romania	UE-27	UE/ Romania
Field crops	7,083.90	14,540	2.05
Horticulture	1,703.52	34,555	20.29
Wine	8,249.39	33,695	
Other permanent crops	4,928.45	21,095	4.74
Milk	4,988.44	14,725	2.95
Other grazing liverstock	5,383.90	13,429	4.94
Granivores	6,650.12	45,708	6.87
Mixed	2,660.14	6,546	2.46

Source: own processing [10].

As the latest RICA report, the one from 2018 presents the data reported for the financial year 2016, we analyzed the situation of the agricultural income of this year, in relation to the activity sector. Thus it is found that the highest incomes are obtained from viticulture (8,249 Euro), followed by the incomes from the large culture (7,084 Euro) and from the exploitation of granivores (6,650 Euro). The lowest incomes are recorded at the level of horticultural farms (Euro 1,704), followed by mixed farms (Euro 2,660). As far as the average U.E. is concerned. The highest incomes are registered at the farms specialized in growing granivores (45,708 Euro), followed by the horticultural farms (34,555 Euro) and those specialized in growing vines (33,695 Euro). The lowest incomes are obtained from the mixed activities (6,546 Euro) and from the big culture (14,540 Euro).
If we make a ratio between the agricultural incomes registered as average of the EU and Romania, we find that the biggest discrepancy exists between the incomes obtained from the horticultural activities that in the EU they are 20 times larger than in Romania. As far as granivorous animals are concerned, the income resulting from their reproduction is 7 times higher in the European Union compared to Romania. The smallest differences are registered in the big culture, for which the revenues at EU level are 2 or more than in Romania and in the mixed farms where the difference is 2.46 or more.

Table 4. Evolution of agricultural entrepreneurial income, by size classes of agricultural farms in the period 2008-2016 (SE430)

Year	2,000-8,000 Euro	8,000-25,000 Euro	25,000-50,000 Euro	50,000-100,000 Euro	100,000-500,000 Euro	≥500,000 Euro
2008	1,836	4,684	11,312	16,500	43,374	160,567
2009	1,730	4,487	10,461	38,102	50,552	288,060
2010	2,272	5,880	15,643	29,913	97,588	831,157
2011	2,543	7,228	18,456	34,191	123,890	358,633
2012	2,307	5,885	14,662	27,154	70,391	416,512
2013	2,655	6,716	15,621	28,670	77,404	347,013
2014	2,469	7,097	18,136	36,633	114,860	578,303
2015	1,547	4,722	12,893	28,917	97,424	851,236
2016	2,106	7,123	18,752	40,144	112,260	810,602

Source: own processing [10].

The size class is the one that influences in turn the entrepreneurial income obtained. Thus we find that the incomes registered by the

agricultural holdings with the economic dimension of more than 500,000 euros represented between 66% (2011) and 85% (2015) of the total income obtained from the agricultural activities. Also the incomes obtained by the farms in the size class 100,000-500,000 euros had weights between 10% (2010 and 2015) and 23% (2011), and those with the size class between 50,000 - 100,000 euros had incomes of 3% (2015) and 10% (2009). Farms in the category 25,000-50,000 euros did not exceed the 5% threshold, while farms with a size between 2,000-8,000 euros, and those with a size of 8,000-25,000 euros had incomes between 1% and 2% respectively (Fig. 2).

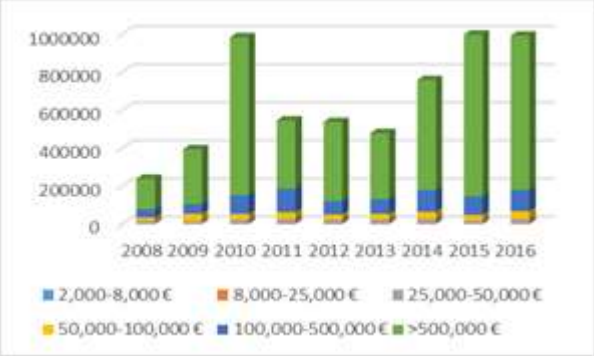

Fig. 2. Structure of agricultural entrepreneurial income, by size categories of agricultural farms
Source: own processing [10].

As I said earlier, there is a direct relation between the size of the incomes registered in agriculture and the way of granting the subsidies. Thus we find that in the case of agricultural holdings with a size between 2,000-8,000 euros, the subsidy granted is about 900 euros, and in the case of agricultural holdings with a size class ≥ 500,000 euros the value of the grants exceeds 280 thousand euros (table 5).

Table 5. The value of the total subsidies, excluding those for investments, in 2016 (Euro)

Size class	Value
2,000-8,000 Euro	900
8,000-25,000 Euro	3,198
25,000-50,000 Euro	11,367
50,000-100,000 Euro	22,245
100,000-500,000 Euro	65,782
≥500,000 Euro	279,168

Source: own processing [10].

Following the situation of decoupled payments, that is, the single payment on the surface and the scheme of the single payment on the surface, including other additional aid [4] [3], we find that the highest value is registered at the level of 2016 for the farms specialized in high culture (4,295 euros), followed by farms specialized in raising other herbivorous animals (1,048 euros) and vineyards (1,042 euros). The smallest values of these decoupled payments are registered in horticultural farms (123 euros).
Compared to the situation at the level of the average EU, we find that the biggest difference exists in the case of specialized farms in other permanent crops than in the U.E. they receive payments decoupled 18.5 times more than Romania, and in farms specialized in growing granivores with payments decoupled almost 5 times higher.

Table 6. The value of decoupled payments, by activity sectors, in 2016 (SE630) (Euro)

Sector	Value
Field crops	4,295
Horticulture	123
Wine	1,042
Other permanent crops	594
Milk	756
Other grazing liverstock	1,048
Granivores	612
Mixed	615

Source: own processing [10].

On the other hand, in Romania the decoupled payments granted to horticultural and wine farms are almost 2 times higher than in the average U.E.

Table 7. The weight of decoupled payments in Romania and the U.E.

Sector	Romania	UE-27	UE/ Romania
Field crops	54.7	73.9	1.35
Horticulture	5.6	2.5	0.45
Wine	12.0	5.9	0.49
Other permanent crops	10.7	19.8	18.5
Milk	14.8	42.4	2.86
Other grazing liverstock	19.0	53.4	2.79
Granivores	2.9	13.5	4.65
Mixed	22.4	71.2	3.22

Source: own processing [10].

Following Net value added per farm, Net income per family farm and Net value added per farm/AWU we find that the highest values are recorded in the case of granivores, wine and field crops farms, and the lowest values are recorded in the case horticultural and mixed farms (Fig. 3).

Average values were registered in the farms specialized in the large culture, other permanence crops, other grazing livestock and milk.

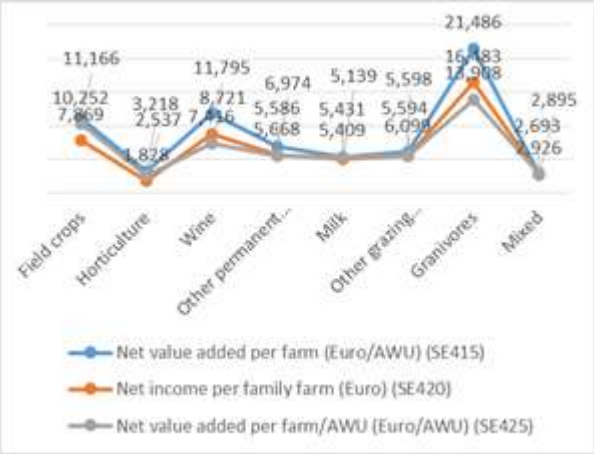

Fig. 3. Net value added per farm, by category of activity, in 2016

Source: own processing [10].

CONCLUSIONS

Even though at EU level, the economic accounts for agriculture (CEA), as well as the agricultural accounting information provided by RICA, are used as instruments for measuring the incomes of farmers, these statistical data cannot provide fully relevant information on the incomes obtained by farmers, nor for the overall economic value of the agricultural sector. Limitations are given by the fact that the collected data refer only to commercial agricultural holdings, and the information regarding the incomes can not always be correctly determined, so that they cannot be and cannot be fully interpreted and used.

The analysis made for Romania shows that there are disparities between the entrepreneurial income obtained in our country and the other states of the EU. There are also gaps between the growth rate of incomes and the size of farms. In small farms the growth rate is almost 4 times lower than in the case of large farms.

Due to the fact that subsidies, at the level of Romania, are much less sustained areas such as horticulture or permanent crops, the entrepreneurial incomes in these sectors are low.

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SOME CONSIDERATIONS REGARDING THE OIL SEED OFFER IN OLT COUNTY (2015 – 2017)

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Abstract

Within the paper, an attempt is made to present an image regarding the evolution of the oil seed supply, in the Olt County, for the period 2015-2017. The processed information was extracted from a recognized database (www.insse.ro), highlighting the trends of establishment and evolution of the county's availability of seeds from species such as sunflower, rapeseed, soybeans etc. Olt County occupy the second place in the south-west Oltenia region. The cultivated area was 78,902.67 ha, the total production reached a level of 165,313.33 t, while the average production is characterized by a general level of 2,095 kg/ha.

Key words**:** *production, rapeseed, soybean, sunflower, surface*

INTRODUCTION

Olt County is situated in the south of Romania, along Olt river. The county held 2.3% of national territory (5,498 km²), places the county on the 22nd place at national level as surface [12].

The production of oil crops, in general, is important in relation to food, industrial, agro technical-technological, as a source of profit or as an article for export [7].

Oil seed production is an important activity of the Romanian agriculture, which ensures the domestic need and an important export article [8].

The sunflower is the main oil crop [10]. The surface cultivated with the sunflower, is variable, based on available information [9].

From the sunflower seed production point of view, Romania occupied the first place in the European Union [4].

The rapeseed is a plant that prefers the temperate climate that has mild winters and cool and summers, being an important world's species plant for oil, cultivated for its oil rich seeds [2].

The Romanian agricultural producers consider soy as a viable solution for the future activity [1]. This aspect is manifested in the context in which Romania registered a negative trade balance for this product [5]. The role played by soy in human nutrition is highlighted by the fact that it is one of the most important assortments of food oil [3]. Soybean seeds are distinguished by the protein having weaker emulsifying properties than other relative flexible proteins [6].

The purpose of the paper is to emphasize the importance of Olt county at the regional and national level, as regards the primary supply of oilseeds.

MATERIALS AND METHODS

The documentation, was elaborated using a credible database from national level (www.insse.ro). Analyzing the data, used time comparison method (dynamic series of 4 terms: 2015, 2016, 2017 and the average period) and space (reporting the county situation at regional and national levels).

The indicators presented refer to the cultivated area (ha), total production (t) and average yield (kg / ha).

RESULTS AND DISCUSSIONS

Areas planted during the period 2015-2017 are shown in table 1 [11].

Table 1. Cultivated Area (ha)

Specification	Year						Average**	
	2015		2016		2017			
	Eff. (ha)*	Str. (%)**	Eff. (ha) *	Str. (%)**	Eff. (ha) *	Str. (%)**	Eff. (ha)	Str. (%)
Total oil plants	67,468	100.00	90,978	100.00	78,262	100.00	78,902.67	100.00
Sunflower	51,549	76.41	71,290	78.36	55,143	70.46	59,327.33	75.19
Rapeseed	15,153	22.46	17,325	19.04	21,536	27.52	18,004.67	22.82
Soya beans	608	0.90	2,270	2.50	1,576	2.01	1,484.67	1.88
Other oil plants **	158	0.23	93	0.10	7	0.01	86.00	0.11

*http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 14.12.2018)
**own determination

Year 2015 is characterized by a total area cultivated with oily plants of 67,468 ha, of which, the main species had weights of: 76.41% sunflower - 51,549 ha, 22.46% rapeseed - 15,153 ha, 0.90% soybean - 608 ha and 0.23% "other oil plants" - 158 ha.

If we analyze the situation of 2016, we find variable areas of oil plants, as follows: 93 ha "other oil plants", 2,270 ha - soybeans, 17,325 ha - rapeseed, 71,290 ha - sunflower. These areas have led to a total of 90,978 ha cultivated with oily plants, of which the following weights were registered: 0.10% "other oily plants", 2.50% soy beans, 19.04% rapeseed, 78.36% sunflower.

For 2017, at the county level, the total area cultivated with oil plants was 78,262 ha, of which the main species occupied: 70.46% sunflower - 55,143 ha, 27.52% rapeseed - 21,536 ha, 2.01% soybeans - 1,576 ha, 0.01% "other oil plants" - 7 ha.

The average of the analyzed period, shows at the county level, a total area cultivated with oil plants of 78,902.67 ha, of which the main oil species achieved: 0.11% "other oil plants" (86.0 ha); 1.88% soybeans (1,484.67 ha); 22.82% rapeseed (18,004.67 ha); 75.19% sunflower (59,327.33 ha).

Reported at national level, Olt County held: 5.84% of the area of sunflower, 4.82% of the area related to oil plants, 3.80% of the area related to rapeseed culture and 1.06% of the area allocated to soybean culture. (Fig. 1).

Analyzing the situation of Olt County, at the level of the South-West Oltenia Region, they appeared variable contributions (in the main species) from 38.51% to 46.07% (for sunflower, soybean cultivated for grains (Fig. 1).

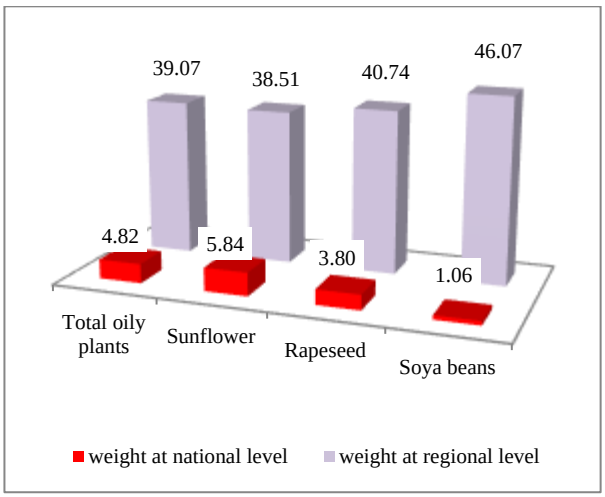

Fig. 1. The cultivated surface. The weight of Olt County at national and regional level - period average (%)
Source: http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 15.12.2018)

The data for total production are presented in Table 2 [11].

Table 2. Total production (t)

Specification	Year						Average**	
	2015		2016		2017			
	Eff. (t)*	Str. (%)**	Eff. (t) *	Str. (%)**	Eff. (t) *	Str. (%)**	Eff. (t)	Str. (%)
Total oily plants	120,458	100.00	138,564	100.00	236,918	100.00	165,313.33	100.00
Sunflower	84,250	69.94	91,526	66.05	176,729	74.59	117,501.66	71.08
Rapeseed	35,379	29.37	43,681	31.53	56,831	23.99	45,297.00	27.40
Soya beans	736	0.61	3,317	2.39	3,348	1.41	2,467.00	1.49
Other oily plants **	93	0.08	40	0.03	10	0.01	47.67	0.03

*http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 15.12.2018)
**own calculation.

In 2015, from the county total of 120,458 t, it is observed that the main supplying crop was the sunflower with 84,250 t - 69.94% of the total, followed by the rapeseed with 35,379 t - 29.37%, the soybeans with a total production of 736 t - 0.61% and by "other oil plants" with 93 t - 0.08% of the total.

The year 2016 is noted by a county level of total oil seed production of 138,564 t, of which the component crops held weights, as follows: 66.05% sunflower - 91,526 t, 31.53% rapeseed - 43,681 t, 2.39% soy berries - 3,317 t, 0.03% "other oily plants" - 40 t.

If we analyze the situation of 2017, we notice that the total oil seed production - 236,918 t - was constituted by variable sequential contributions. Thus - in ascending order - the crops contributed: 10 t "other oily plants" - 0.01%, 3,348 t soybeans - 1.41%, 56,831 t rapeseed - 23.99% and 176,729 t sunflower - 74.59%.

Average of the period was achieved using the data presented above, which is characterized by a total county level of 165,313.33 t, whose structure was the following: 71.08% sunflower - 117,501.66 t; 27.40% rapeseed - 45,297.0 t; 1.49% soy beans - 2,467.0 t; 0.03% "other oil plants" - 47.67 t.

At national level, the weights was variable (main species) from 0.81% for soybean crop (being less than surface weight), up to 5.24% for sunflower culture (less than surface - Fig. 2).

Reported to the regional situation, Olt County obtained: 42.27% of soybean production, 39.20% of rapeseed production, 36.95% of total oilseed production and 36.10% of sunflower (Fig. 2).

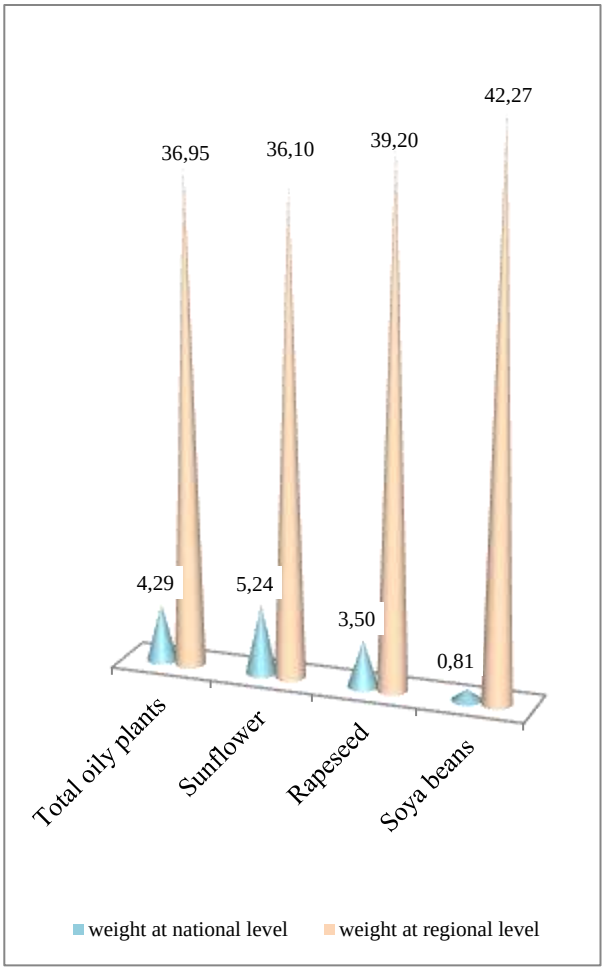

Fig. 2. Total production. The weight of Olt County at national and regional level - period average (%)
Source: http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 15.12.2018)

Average production are shown in Table 3 [11].

Table 3. Average yield (kg/ha)

Specification	Year						Average**	
	2015		2016		2017			
	Eff. (kg/ha)*	% compared to the total **	Eff. (kg/ha)*	% compared to the total **	Eff. (kg/ha)*	% compared to the total **	Eff. (kg/ha)	% compared to the total
Total oily plants	1,785	100,00	1,523	100,00	3,027	100,00	2,095	100,00
Sunflower	1,634	91.54	1,284	84.31	3,205	105.88	1,981	94.56
Rapeseed	2,335	130.81	2,521	165.53	2,639	87.18	2,516	120.10
Soya beans	1,211	67.84	1,461	95.93	2,124	70.17	1,662	79.33
Other oily plants **	589	32.99	430	28.23	1,429	47.21	554	26.44

*http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 15.12.2018)
**own calculation.

In 2015, the county obtained a total average production of 1,785 kg / ha, compared to which- at the level of the component crops of the group - the situation was as follows: 1,634 kg / ha at sunflower (91.54% compared to the comparison term - the level indicator overall), 2,335 kg / ha for rapeseed (130.81%), 1,211 kg / ha for soybean cultivation (67.84%) and 589 kg / ha for "other oil plants" (32.99%).
The year 2016 registered an average county production of 1,523 kg / ha, against which are found positions of the oil crops as follows: 28.23% "other oil plants" - 430 kg / ha, 84.31% sunflower - 1,284 kg / ha, 95.93% soybeans - 1,461 kg / ha and 165.53% rapeseed - 2,521 kg / ha.
For the year 2017, at the county level variable yields were obtained from 1.429 kg / ha for "other oil plants" (-52.79% compared to the county level) up to 3,205 kg / ha for sunflower culture (+5.88%). The other crops, were positioned below the level of the indicator (3,027 kg / ha), as follows: rapeseed -12.82% (2,639kg / ha), soybeans -29.83% (2,124 kg / ha).
The average of the period shows an average production of 2,095 kg / ha, against which the positioning of the crops was the following: -73.56% "other oil plants" - 554 kg / ha; -20.67% soybeans - 1,662 kg / ha; -5.44% sunflower - 1,981 kg / ha; +20.10% rapeseed - 2,516 kg / ha.
Reported at the national level, Olt county has realized average productions per strictly subunit productive unit (from 76.73% in soybean to 92.81% for of rapeseed - Fig. 3).

Analyzing the Olt County situation, in regional context, one can see that it did not exceed the reporting period in any situation. The negative differences were 2.37, 5.42, 7.17 and 8.58% for rapeseed, general level, sunflower and soybean respectively (Fig. 3).

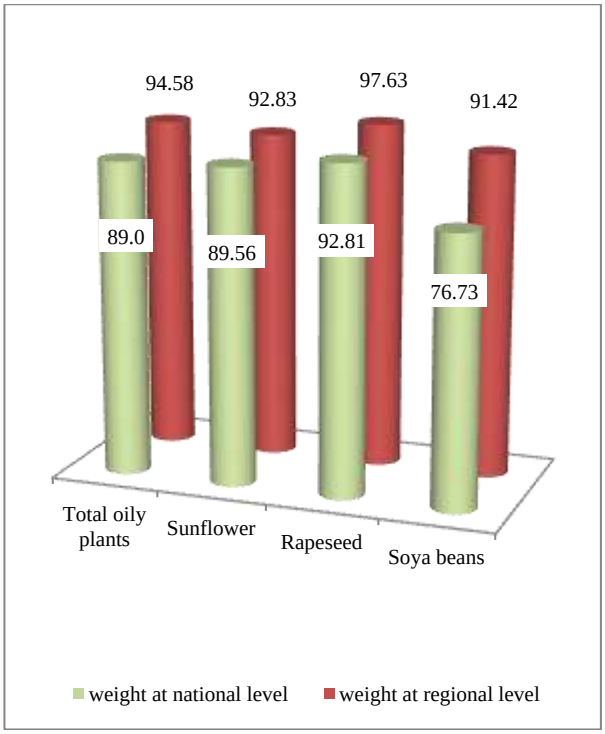

Fig. 3. Average production. Positioning of Olt county at national and regional level - period average (%)
Source:http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 15.12.2018)

CONCLUSIONS

First of all, it is worth noting a fairly limited range of oil crops practiced, at the county

level: sunflower, rapeseed, soybean, and "other oil plants".

Regarding the cultivated area it is noted: within the total area of 78,902.67 ha the sunflower predominates (75.19%), followed at a considerable distance from rapeseed (22.82% weight); the indicator has evolved fluctuating, over time, for the entire cultivated area, an aspect that is manifested in most crops, with the exception of rapeseed and "other oil plants" which have registered ascending and descending evolutions respectively.

If we refer to the total production, the following aspects should be noted: the county obtains a total production of 165,313.33 t, to which the most contributions were made by the sunflower, followed by rapeseed, the rest of the crops not even reaching the 2% threshold; the indicator evolution was an ascending one (as opposed to the surface - non-uniform evolution). Only for "other oil plants" is a downward evolution.

Regarding the average production, we should point out: the general level of 2,095 kg / ha of the indicator, against which there are recorded rapids, as well as lower levels in sunflower, soybean and "other oil plants" respectively (in the last in this case the level is significantly lower than the county average); at general level, the indicator has evolved fluctuating, a situation that is manifested in most cultures, excepting rapeseed and soybeans (upward trends).

Olt County is an important producer of oilseeds at national and regional level, but this situation needs to be improved by increasing the productive performances (based on adequate cultures management).

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SOURCES OF RENEWABLE ENERGY AND OBTAINING THERMAL ENERGY BY DECOMPOSING VEGETABLE MATERIAL

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Abstract

The present study aimed at the experimental realization of an installation for obtaining the thermal energy by decomposing the plant material. The prototype was made within the Faculty of Agricultural Sciences Food Industry and Environmental Protection, from the Lucian Blaga University in Sibiu, in the discipline of Renewable Energy Sources. This method resulted in bacterial decomposition of wood mass from forest waste which resulted in 14 months of hot water for heating the home (4 l/min), domestic hot water and biogas.

Key words: *thermal energy, experimental installation, composting*

INTRODUCTION

At the global level at present, renewable energy sources are defined as energies that come from natural sources with the property of regenerating themselves naturally within a very short period, or they can be sources that are practically inexhaustible. The notion of renewable energy defines forms of energy resulting from the natural renewable processes produced by energy transfer. Such energy sources are classified into those produced by solar energy, wind energy, flowing water energy, but also biological processes and those produced by geothermal heat that can be captured by humans through different processes. Other non-renewable energy sources also include nuclear energy, but also energy from the burning of fossil fuels, such as oil, natural gas and coal [1, 5].

Of the many elements needed for microbial decomposition, carbon and nitrogen are the most important [3, 8]. Carbon provides both an energy source and the basic building block, which makes up about 50% of the microbial cell mass. Nitrogen is a crucial component of proteins, nucleic acids, amino acids, enzymes and coenzymes required for cell growth and function [1, 4].

Another essential ingredient for successful composting is oxygen. Because microorganisms oxidize carbon to energy, oxygen is consumed, and carbon dioxide is produced. Without enough oxygen, the process will become anaerobic and will produce unwanted odors, including the smell of rotten egg from hydrogen sulfide [6].

The successful experiment carried out by the French inventor Jean Pain in the 70's has shown without hesitation the possibility of achieving energy independence for a house in the rural area [2, 7, 10]. By this method, which meant the bacterial decomposition of wood mass from forest waste, it obtained for 14 months hot water for heating the house (4 l/min), domestic hot water and biogas.

Given the need for relatively large outdoor spaces to store around 50 tons of milled wood, the above method is perfectly suitable for the rural area and not the urban area.

MATERIALS AND METHODS

The main objective of my study is the design and implementation of an experimental module that, to highlight the operation of a hot water installation through bacterial degradation usable in the urban environment. In order to achieve this goal, the concept must meet the following conditions:

- not to affect the environment by smell and humidity;
- not to contaminate the dwelling and/or the space intended for installation with bacteria or other pathogenic microorganisms;
-to be modular allowing the interconnection according to the energy requirement of the building;
- the modules can be adapted dimensional to the spaces intended for them;
- the cost prices should be reduced, by using recyclable resources from plastic and ferrous materials.

The material used as active mass for obtaining heat energy is dry grass. We chose this material because it is a resource is abundant, easily accessible and can be dried and prepared quickly for the experiment.

RESULTS AND DISCUSSIONS

The experimental installation is composed of two zones: the active environment zone in the lower half and the thermal transfer zone to the heating agent used in the upper zone. The active environment is fixed in boxes in an upright position using a polyethylene monofilament yarn. The crates are perforated all over the surface to allow optimal air circulation.

Given that the maximum density of thermophilic microorganisms is located on the outer surface of the layer, the crates after interconnection form slots that facilitate the movement by natural convection of the air. The following photo figure shows the convection mode of the air.

At the top there is an air-liquid heat exchanger which has the role of taking over and transferring the heat from the active environment. The support plates of the exchanger pipes have the role both to increase the surface of the thermal transfer and to facilitate the displacement of the vitiated air due to the perforations around the pipes towards the exhaust.

The exhaust pipe is provided with an activated carbon filter for stopping odors.

As an aerobic process the density of the active material must be carefully considered. From the practice it was found that in the case of too large interior spaces, drying by air circulation is favored. In the case of spaces too small, the air circulation will be made difficult, even leading to the clogging of the active environment.

The whole assembly is kept closed by the polystyrene walls. They maintain constant thermal and humidity conditions inside the plant.

In order to maintain humidity, the equipment is provided with a spray system at the top of the crates.

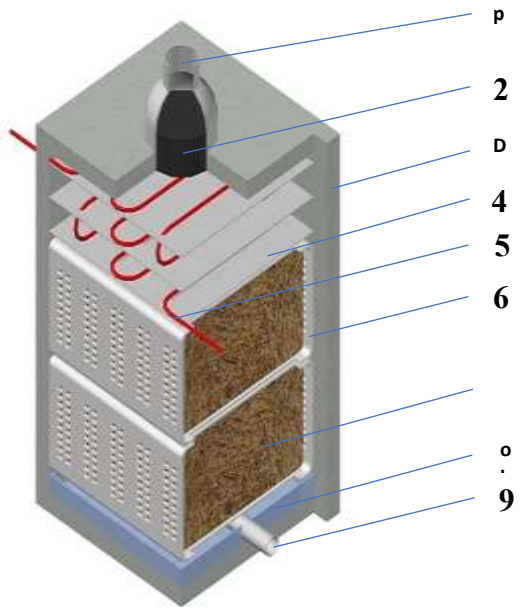

Photo 1. The experimental way of obtaining thermal energy through bacterial degradation
Legend:
1. Exhaust air exhaust connection;
2. Activated carbon filter;
3. thermal insulation;
4. Support plates for the heat exchanger;
5. Circulation pipe of the thermal agent;
6. Crate support for active material;
7. Active material;
8. Tray for collecting the excess moisture; 9. Air supply connection (orig.)
Source: Own design.

Technical specifications and dimensional calculations:

Experimental module dimensions: 50 X 60 X 100 cm

Heat exchanger element dimensions: 40 X 50 cm

Number of heat exchanger elements: 3

Length of heating circuit plate: 160 cm
Total length of thermal agent circuit: 160x3 = 480 cm
Heat volume:
- an inside diameter of the pipe of 8 mm was considered

$$V = V=\pi(d/2)^2 \, l\_conduct=\pi(0.8/2)^2$$
$$480=241.26 \text{ cl}=2.41 \text{ l}$$

Average active volume/crate:

$$V_{average} = 27.5 \text{ X } 37.5\text{x}7= 7{,}218.75 \text{ cm}^3$$

Total average active volume:

$$V_{total} = 7{,}218.75 \text{ X } 10 = 72{,}187.5 \text{ cm}^3$$
$$\text{aprox. } 0.07 \text{ m}^3$$

Photo 2. Convective air circulation inside the module
Source: original.

Preparation of the experiment

A solution with the culture medium was prepared by mixing 10 l water and 1 kg humus from the forest.
For all 10 crates, a conatation of 5 kg was used, returning to each crate 0.5 kg dry grass. This quantity was evenly distributed and manually pressed (Photo 3).
After pressing, to keep the grass inside the plant upright, it was fixed with polyethylene wire in the form of a grid. It was then followed by soaking the material in the solution previously prepared and draining the water by keeping the crate horizontal.

Photo 3**.** Distribution and pressing of the vegetal material
Source: original.

Each 5 boxes, after their interconnection, were inserted inside the equipment on two rows (Photo 4).
As a thermal agent I used mineral oil. It has the property of remaining permanently in liquid state during the experiment.
Given that the experiment is carried out over a long period of time, the measurements were performed daily for a period of 2 months.
The parameters followed were the temperature of the thermal agent, the temperature of the active mass, the humidity and the concentration in carbon dioxide determined at the top of the installation.

Run the experiment

At 7-day intervals we monitored the degree of decomposition of the plant material used
In order to keep the humidity constant at 90% relative humidity after each determination, the spray and aeration system was started.

Photo **4.** Construction of the installation
Source: original.

Photo 5. Settling the plant biomass in the box set
Source: original.

Experimental results

In this experiment, we followed the way in which such a system behaves, thus establishing its viability.

If during the first 7 days the temperature was maintained around 30 °C in which the activity of the mesophilic bacteria was recorded in the next 7 days the temperature rose to 55-60 ºC and remained constant at this level due to the activation and replication of thermophilic bacteria.

The measurements are presented in the table below.

Photo 6. Temperature measurement during the experiment
Source: original.

Table 1. Variation of the temperature of the thermal agent over the entire measurement period
Source: original

Day	Temp. [ºC]	Day	Temp. [ºC]	Day	Temp. [ºC]
1	21.4	21	42.1	41	63.6
2	21.6	22	45.6	42	62.2
3	21.3	23	49.8	43	63.9
4	21.9	24	54.3	44	61.6
5	23.1	25	54.8	45	58.0
6	27.8	26	55.9	46	61.7
7	30.3	27	56.0	47	63.8
8	32.3	28	56.9	48	61.9
9	33.5	29	57.5	49	59.5
10	33.7	30	56.3	50	62.9
11	33.9	31	58.3	51	61.0
12	34.2	32	59.7	52	63.7
13	34.5	33	57.8	53	59.3
14	34.7	34	62.2	54	60.7
15	34.9	35	59.7	55	60.7
16	35.3	36	61.4	56	62.9
17	35.5	37	62.4	57	59.8
18	35.9	38	59.8	58	61.3
19	36.6	39	57.5	59	62.2
20	38.8	40	59.8	60	61.7

Source: original.

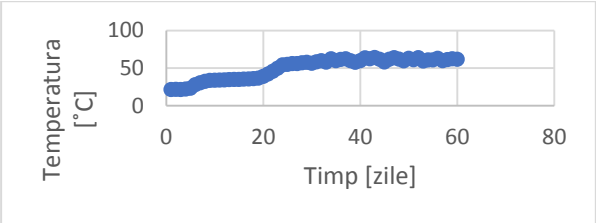

Fig. 1. Temperature variation during the measurement period
Source: original.

CONCLUSIONS

The experimental data demonstrated the viability of the proposed system. As such, the possibility of creating an installation that works in the urban environment can be said to be realistic.

In the conditions in which we considered it appropriate to develop an experimental installation without automation system regarding the aeration of the active environment in the conditions of its deprivation of sufficient oxygen, choosing the manual, daily alternative, to determine the carbon dioxide we can say that the operation has given good thermal results.

Based on the obtained results, the following recommendation has been done:

- the current spray system, due to the complexity of the tube arrangement so that it evenly moistens the mass of active material, it can be replaced with an ultrasonic fog generator. In this way, the entire active surface of the decomposing material will be moistened.

The location of the fog generator on the air supply circuit which leads to the penetration of water vapor into the material depth. From practical experience it has been shown that the replacement with perforated vertical plates of crates will lead to an adequate adjustment of the density of the active material.

It is compulsory to automate the air inlet, the humidity control and the intermittent discharge of the thermal agent once the operating temperature is reached. In this way, we can determine the amount of heat provided by a modular unit and we can size an installation that energetically supports a building.

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CURRENT NATIONAL AND REGIONAL TRENDS FOR ROMANIAN AGRITOURISM

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Abstract

Agritourism is one of the most suitable options available for farmers to ensure increased income. It can also serve as instrument to revive regional economy and conserve rural societies and landscapes. In Romania, agritourism sector has an overall growing trend between 2016-2018, but is marked by uneven development across regions. Largest number of agritouristic enterprises in Romania are located in counties from Transylvania followed by eastern part of Romania: from Bucovina down to Danube Delta and Black Sea. Proximity to mass touristic attractions creates a high-competition economic climate for agritourism enterprises from counties Sibiu and Braşov. Agritourism growth might be currently available for counties Cluj and Alba. County Satu-Mare has a low existing capacity, but the trend is not steady. Success of agritourism enterprise could be enhanced by increasing training level of the staff in order to overcome competition from other accommodation and leisure providers and establish sustainable strategies for agritourism development.

Key words**:** *farm, accommodation, enterprise, traditional, cuisine, leisure*

INTRODUCTION

Agritourism refers to commercial tourism enterprises on working farms. Most of them follow a family-based business model and provide earning diversification for rural landholders. From current commercial considerations this is one of the most suitable options available for farmers to ensure income increase, besides expanding acreage, intensifying production, specializing crops or livestock, selling land or working off-farm [8]. The concept of agritourism is related to the resilience strategy of a single farm and increased autonomy, which aims to strengthen farm resource base without becoming dependent upon financial and industrial capital [10]. Especially in Europe as well as in North America, agritourism is seen as a policy instrument to revive regional economy and conserve rural societies and landscapes, having both economic and social motivation [8, 9]. Agritourism is not a new phenomenon and is identified as touristic offer since 1960 [2, 3]. Recent revived interest in agritourism entrepreneurship is strongly related to capacity to support the sustainable development of rural communities [4]. A notable trend in agritourism is commodification of traditional cuisine as signifiers of regional identity and constitutes a frequent success strategy used in rural tourism. At the same time in some regions of EU, certain policies come to reinforce the niche of agritourism services trying to prevent it from coming too close to mass activities. It is still seen as complementary activity and although it does not represent a strong competition to hotels, it may be for other types of establishments. Agritourist profile corresponds to young families with children, urban people and groups of people trying to come in touch with rural roots [10]. An agritourist is offered services such as: accommodation, meals and leisure activities which can vary by region and country but is mainly centred on traditional or local culture [1, 5, 12]. Sustainability of this type of tourism requires adequate protection of natural and cultural resources specific to given rural areas [6]. Aim of this study was to identify the current trend for Romania agritourism sector from national to regional

level, with emphasis on dynamic within Transylvania where this type of tourism sector has great potential.

MATERIALS AND METHODS

Information was retrieved from three reports edited by National Statistics Institute of Romania: touristic accommodation capacity existing at 31 July 2016, 2017 and 2018 [7]. Data used were:
- number of agritouristic accommodation establishments per 4 macroregions
- accommodation capacity (places/beds) per 4 macroregions
- number of agritouristic accommodation establishments within macroregion 1
- number of rooms in agritouristic accommodation establishments in 12 counties of macroregion 1.

The statistics take into account the agritouristic establishments with a minimum of five places/beds.

Results are presented using geocode standard for nomenclature of territorial units for statistics with corresponding 3 NUTS levels: macroregion, region, county - as adopted by EU (Fig. 1).

Fig. 1. Regions of development from Romania
Source: [11].

Based on data from macroregion I was performed the comparison between counties based on opportunity score. Assessment method proposed here is original and involves obtaining a score for each county by applying a formula.

- opportunity score = $(a+b)/c$, where "a" = trend of 2016-2017, "b" = trend of 2017-2018, "c" - average existing rooms for three years: 1: (<500), 2: 501-1,000, 3: (>1,000)
- a, b are marks on a scale from 1 to 3, where: 1 = low/negative, 2 = average/positive, 3 = high/largest increase.

RESULTS AND DISCUSSIONS

In Romania, nearly all agritourist enterprises are privately owned but there are also some establishments with other forms of property such as state property, foreign-owned or cooperation-based establishments. Some establishments function only seasonal while some are available all year round [7].

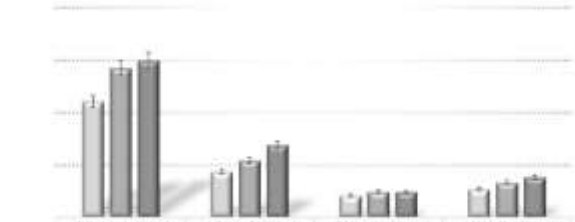
Across the four macroregions of Romania, can be distinguished differences in the development of this sector, but with an overall growing trend between 2016-2018. Largest number of agritouristic enterprises are located in macroregion I which corresponds to counties from Transylvania followed by macroregion II which corresponds to eastern part of Romania from Bucovina at its northern part, down to Danube Delta and Black Sea to the south. It can be inferred that geographical location plays a major role for uneven development of Romanian agritourism sector. First important factor of attraction to these regions is constituted by diverse landscape and possibility to enjoy nature and outdoor activities. Secondly, these areas have a long tradition for tourism with many cultural touristic attractions such as castles, fortresses and monasteries. And not at last, many of these areas are unsuitable for large farms and agritourism becomes pivotal for financial stability of the community increasing the motivation of farmers to engage in secondary activities for extra income (Fig.1).

Between 2016-2017 the largest increase for number of agritourism establishments was found in macroregion I but between 2017-2018 the largest increase for number of agritourism establishments was found in macroregion II. A slight decrease can be noticed between 2017-2018 for number of

agritourist establishments in macroregion III (Fig. 2).

Dynamic for accommodation capacity expressed as places/bed in agritouristic establishments, shows a positive trend at national level between 2016-2018.

However, the national percentage increase shows a slow-down in the second interval, with an increase below 10% between 2017-2018 (Fig. 3). These may come to indicate the current evolution towards a mature market for this niche sector as well as increased competition.



	Macroregion 1 (RO1)	Macroregion 2 (RO2)	Macroregion 3 (RO3)	Macroregion 4 (RO4)
2016	1,107	440	211	270
2017	1,427	546	247	336
2018	1,499	692	246	384

Fig. 2. Evolution of number of agritouristic enterprises for the 4 macroregions from Romania
Source: [7].

At national level in summer of 2016 were available over 30,000 places/bed while by summer of 2018 were over 45,000 places/bed in agritouristic accommodation units across Romania.

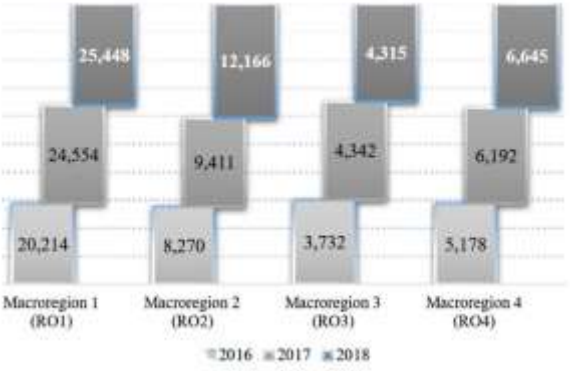
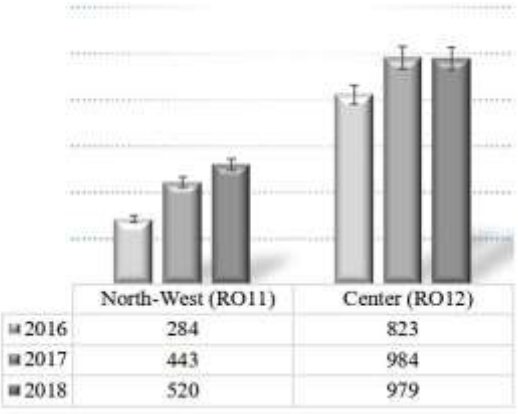


Fig. 3. Evolution of accomodation capacity (number of places/beds) in agritouristic accomodation establishements from Romania
Source: [7].

Expressed as percentage from all types of accommodation units at national level, agritouristic sector experiences a nearly constant expansion rate from one year to another: from 11.37% in 2016 to 12.95% in 2017 and to 13.75% in 2018. This trend, however, is marked by uneven development across regions of Romania following same trend as the number of agritouristic enterprises.

Within macroregion 1, identified as hotspot for Romanian agritourism, where largest proportion of this type of enterprises are located presents some interesting dynamics in last three years.

Firstly can be noted that by far the Center region of development (comprised by six counties: Alba, Braşov, Covasna, Harghita, Mureş and Sibiu) clusters the largest number of agritouristic establishments from macroregion I. However, the North-West region (comprised by six counties: Bihor, Bistriţa-Năsăud, Cluj, Maramureş, Satu-Mare, Sălaj) although with less than half of the capacity of Center region, it maintains a positive trend between 2016-2018. Absolute growth for number of agritourist enterprises between 2016-2017 was similar: 159 for North-West region and 161 for Center region (Fig. 4).



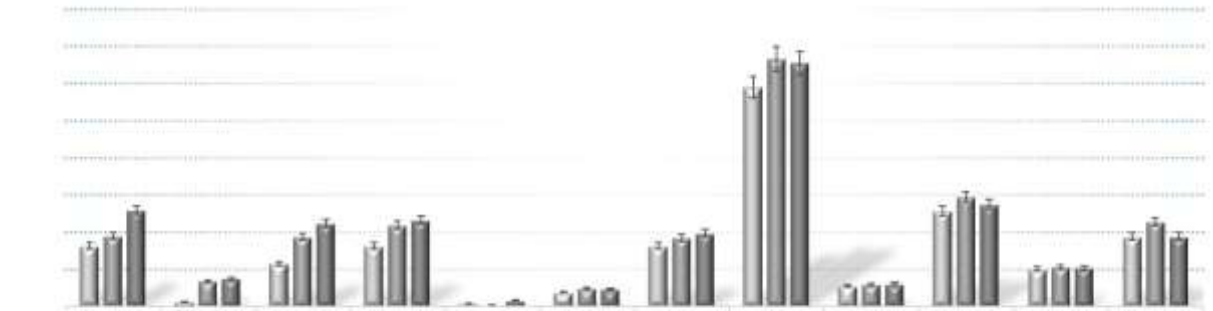
	North-West (RO11)	Center (RO12)
2016	284	823
2017	443	984
2018	520	979

Fig. 4. Evolution of number of agritouristic accomodation establishments within macroregion 1 of development from Romania
Source: [7].

In relative values however, this corresponds to a larger increase for North-West: over 50%, while for Center region an increase of less than 20%. Further, between 2017-2018 the increase slows-down for North-West but remains positive with 17.4% increase, while

Center region experineces a slight decrease (-0.5%). This trend shows that althought Center region condenses a large number of agritoursitic entreprises it also experinces high competition with many establishments that have a well-consolidated place on the market. This signifies that it might be very difficult for new enterprsises to enter the bussiness in this region and this largely may come to trying to build a strong identity to distinguish them from other operators right from the bigining, by offering distinctive services or better prices. But, this could hinder growth in the immediate period.

For a closer look it is examined the dynamic for number of agritoutsitic establishments across 12 counties from macroregion I (Fig. 5). Data confirms the trend observed at regional level. From North-West region between the studied intervals, only county of Satu-Mare experiences a decrease in number of rooms in agritoursitic establishments between 2016-2017, and only county of Salaj presents a slight decrease beween 2017-2018.



	Bihor (RO111)	Bistrița-Năsăud (RO112)	Cluj (RO113)	Maramureș (RO114)	Satu-Mare (RO115)	Sălaj (RO116)	Alba (RO121)	Brașov (RO122)	Covasna (RO123)	Harghita (RO124)	Mureș (RO125)	Sibiu (RO126)
2016	816	63	579	816	42	196	818	2,951	278	1,286	509	945
2017	948	346	942	1,097	27	246	923	3,330	298	1,474	535	1,142
2018	1,293	378	1,116	1,161	84	240	988	3,274	306	1,379	524	945

Fig. 5. Evolution of number of rooms in agritouristic accomodation establishments from the 12 counties of macroregion 1
Source: [7].

Counties from Center region experience no decrease between 2016-2017 while between 2017-2018, four out of six counties from this region experience a decrease for number of rooms in agritouristic establishments. A steep decrease of rooms is evident for Sibiu county (-17.3%) followed by Harghita county (-6.4%) and to a lesser extent for counties of Mureș (-2.1%) and Brașov (-1.7%). Largest increase for the number of rooms in relative value is evident between 2016-2017 for counties of Bistrița-Năsăud followed by Cluj. Between 2017-2018 largest increase is observed for county of Satu-Mare which in previous year experinced a steep decrease in number of rooms, followed by Bihor with an increase of 36.4%. Several counties are seen to maintain a growing trend for number of rooms between 2016-2018: four counties from North-West region (Bihor, Bistrița-Năsăud, Cluj and Maramureș) and two counties from Center region (Alba and Covasna). The positive trend maintained for number of rooms in these counties in studied intreval, indicates that there is demand and opportinity for opening new establishments in these areas and that market has not reached the saturation point. However it is important to mention that overall increase for number of rooms in macroregion 1 between 2017-2018 is at less than a half (21.7%) from the percentage increase observed between 2016-2017 which does indicate a slow-down of demand.

Following the analysis can be deduced that there are several aspects that have to be considered by farmers interested to open establishments. Firstly, macroregion I and II have great potential due to natural and cultural attractions, but as detailed analysis within macroregion I shows, there is a strong uneven

trend across regions and counties. These trends may allow a classification based on risk and opportunity.

In Table 1, can be observed the opportunity score obtained or the 12 counties from macroregion I of development from Romania, in ascending order. On this score scale, the lower the score the higher the efforts the farmers would have to make to ensure success of the enterprise. This means that a farmer has to consider thoroughly many aspects to find and maintain a place on the market.

Although counties from Center region are located in areas attractive to tourists due to numerous historic touristic objectives, it already concentrates a large number of agritouristic enterprises, while decreasing number of rooms for counties of Sibiu and Brașov come to show a high-competition economic climate. This might translate in higher risk for prospective farmers interested to offer agritouristic accommodations.

Table 1. Agritourism current opportunity assessment in counties of macroregion I – Romania

County	Trend *a*	Trend *b*	Capacity *c*	Score $(a+b)/c$
Brașov	2	1	3	1.0
Harghita	2	1	3	1.0
Sibiu	2	1	3	1.0
Maramureș	2	2	3	1.3
Mureș	2	1	2	1.5
Bihor	2	3	3	1.7
Alba	2	2	2	2.0
Cluj	3	2	2	2.5
Sălaj	2	1	1	3.0
Satu-Mare	1	3	1	4.0
Covasna	2	2	2	4.0
Bistrița-Năsăud	3	2	1	5.0

Source: Original.

Services offered by agritourism establishments compete with other types of highly specialized accommodation providers such as hotels, or bed and breakfast etc., precisely due to proximity to historic touristic attractions. This is why proximity to mass touristic objectives may cause the volatile market for agritourism enterprises in these areas which classify as good for opportunity but high for risk. Constant challenges come from the continuous struggle to find best way to constantly increase quality of services but still maintaining low prices, which may place a considerable strain. Additional may be required to concentrate on designing distinctive leisure services to attract customers and distinguish from competition. This can become particularly difficult, if agritourism is operating with less specialized staff without expertise in hospitality business to establish strategies for sustainable success. In these areas, the agritourism requires more investment and long-term strategy.

Counties Bistrița-Năsăud and Covasna maintained a positive trend during the study interval but also showed a slow-down. County Satu-Mare has a low existing capacity but the trend between 2016-2018 is neither steady nor constant.

Place for moderate agritourism growth might currently be available for farmers from counties with average opportunity score such as: Cluj and Alba which experienced no decreasing trend and are neither situating among counties with highest capacity. County of Bihor on the other hand, although also had a positive trend, currently presents a higher accommodation capacity which might indicate an approaching temporary flat point for local agritourism.

Previous authors consider Apuseni Mountains (north-western part of Romanian Carpathians mountain range located in Transylvania) as particularly suitable for agritourism enterprises due to wide range of agritourism activities and because it has a low degree of urbanization, of under 30% [3]. Other authors identify the opportunity for fruit and vegetable farmers from vicinity of eastern Romanian Carpathians – to use agritourism as immediate local short marketing chain for their farm products [13].

CONCLUSIONS

In Romania, agritourism sector has an overall positive growing trend between 2016-2018 but is marked by uneven development across regions.

It can be inferred that geographical location plays major role for uneven development of

Romanian agritourism sector. Hot spots for agritourism are in counties with many natural, cultural, and historical touristic attractions.
Macroregion I comprises the largest number or agritouristic establishments but shows a slow-down between 2017-2018.
Center region experiences high competition, while North-West region shows potential for growth.

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INFLUENCE OF VARIETIES AND SOME QUALITATIVE INDICATORS UPON ON YIELD OF SEVERAL WHEAT VARIETIES IN SOUTH EASTERN PART OF ROMANIAN PLAIN

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Abstract

All grown plants have high nutritional value but wheat is the most important. The quality of gluten (viscosity, elasticity, extensibility, resistance to proteolytic fermentation in the fermentation process, etc.) is very important, it gives wheat quality. The protein content of the grains is a most important qualitative factor that gives the harvesting use value. The gluten content is dependent on the protein content of the grains. It is an indicator on the basis of which the quality class of the harvest obtained is determined. The researches studied the crop behaviour of six Premium wheat varieties in the soil and climate conditions in Calaraşi area during 2017. We analized some qualitative indicators (the content in protein and gluten, the hectolitre weight and a mass of 1000 grains). The best results were recorded in Tamino variety, where the efficiency reached 8,985.0 kg / ha.

Key words**:** *wheat, qualitative indicators, yield, technology, varieties*

INTRODUCTION

Wheat is a grown plant with a high nutritional value [6]. This plant can be sown on extended areas. The attention that the plant enjoys is due to the high content of the grains in carbohydrates and proteins and the rate of these substances corresponding to the requirements of the human body. Another advantages of this plant are long preservation of the grains and the fact that they can be transported without difficulty [7].
Wheat offers the advantage of being fully mechanized, from agronomical point of view [8]. Wheat is a very good precursor for most crops, because it leaves the field early and allows the ploughing done even from summer [10].
The wheat quality is due to the quality of gluten (viscosity, elasticity, extensibility, resistance to proteolytic fermentation in the fermentation process, etc.) [9]. The protein content of the grains is the most important qualitative factor that gives the harvesting use value after production, which is the quantitative indicator [1].
The moist gluten content is an indicator of the particularly important quality, which determines the quality class of the harvest and is dependent on the protein content of the grains [2] and the quality of the bakery wheat. The values of this indicator can vary between 0 and 100% [13].
The basic criterion for the choice of varieties regardless of the grown cereal variety remains the potential for production. We should not neglected, also, the quality that gives the market value of the harvest [4].
The quality of the genetic material of the studied varieties was highlighted by the high quality indices and very high efficiency, so Premium wheat varieties come to farmers who were unwilling to sacrifice the production for quality [3]. Knowing the quality of wheat harvest is very important for the millers (they are interested in benefits following the sale of the fine) and for the bakers, who are interested in bakery indicators [12].

In order to increase the production at the surface unit, it is needed to use more and more efficient biological material (varieties and hybrids) [5]. The crop can be increase by using modern technologies, application of scientific research results and the use of innovations in the agricultural production [11].

MATERIALS AND METHODS

The researches follow the study of the crop behaviour (efficiency) of six wheat varieties in the soil and climate conditions of Călăraşi area during 2017. We analized some qualitative indicators (the content in protein and gluten, the hectolitre weight and a mass of 1,000 grains). We used three variants, each variant having three repetitions, the surface of the experimental plots being 150 square meters. In table 1 are presents the varieties with early precociousness. We choose Arnold variety as control for comparing the results.
The experiments took place in the natural environment provided by the experimental field of SC Probstdorfer Saatzucht Romania SRL, in Modelu locality, Calarasi County, and the quality indicators determinations in the company own laboratory.

Table 1. Experimental variants

Variant	Variety
V1	ARNOLD-**Mt**
V2	BITOP
V3	FULVIO
V4	LAURENZIO
V5	MIDAS
V6	TAMINO

The experience was placed on chernozem, a soil category with excelent properties, rich in high quality humus (mull calcic).
Water supply of crops is the main problem of agriculture in the county, due to the rain regime, which varies greatly during the vegetation period.
This rain regime is more favourable to the physiological requirements of autumn wheat than maize that is affected by the drought between July and August period.
The climate in the Baragan Plain is of temperate oceanic and temperate continental type, with rarer tropical continental and tropical sea air, but also Arctic air.
Summers are cold, with little precipitation and winters are relatively cold, sometimes marked by strong snowstorms, but also by frequent heating periods. The average annual temperature is 11.35°C, and the maximum recorded so far is 41.1 ° C in Calarasi. The absolute minimum was recorded at Calarasi (-30.0 ° C) on 9th January 1938.

Table 2. Precipitations recorded in Modelu locality, during the period 2012-2017

Month	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	
year	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	**P mm**
2012	78	-	8	30	154	20	6	66	47	34	13	51	**507**
2013	50	43	18	41,5	50	121	18	46	112	44	8	-	**551.5**
2014	11	-	51	29	112	93	48	12	37	64	43	113	**613**
2015	27	57	88	44	6	52	39	56	29	73	101	-	**572**
2016	13	21	49	53	74	48	23	33	52	20	74	-	**460**
2017	-	17	65	57	49	50	132	20	-	-	154	37	**581**
Average 2012-2017	**29.8**	**23**	**46.5**	**42.4**	**74.2**	**64**	**44.3**	**38.8**	**46.2**	**39.2**	**65.5**	**3.5**	**574.4**

Source: Modelu Weather Station.

The relief is uniform, specific to the plain area, and the predominant winds in Calarasi county are those from the North and North-East (Crivat and Austrul), as well as from the West and South-West (Baltaretul).
The observations on precipitation variation were made in Modelu, Calarasi County, in the period 2012-2017, with its own rain meter.
In terms of precipitation volume (table 2), we can see that the highest values (613mm) were recorded in 2014, 2016 having the lowest values (460mm). The average of 574.4mm

precipitation was exceeded in the year 2014 (613mm) and year 2017 (581mm). Regarding the monthly precipitation volume in 2012-2017, we can see that May, June and November were the rainiest periods.

The technology used was in the scarification work followed by a disk work concomitantly with DAP type fertilizer work. Sowing was performed on 10th October. Chemical fertilizers was applied at a rate of 200 kg in March with NH4NO3 and 200 kg DAP in April. For phytosanitary treatments we used Biscaya insecticide, Menara fungicide and Mustang herbicide.

Premium wheat varieties chosen for research are: Arnold, Bitop, Fulvio, Laurenzio, Midas and Tamino.

ARNOLD wheat variety. It is a very early, with a high trunk and a very good resistance to diseases. It offers good productions with a high quality and can be grown on highly climate-differentiated surfaces. ARNOLD have a moist gluten content of over 35%. It is recommended a growth regulator at the end of the twinning or at the beginning of the straw stretch - between the first and second internodes (2 L/ha).

BITOP wheat variety. Premium wheat, very early in the bakery Group 8, offers excellent productions and high protein content. BITOP is very resistant to dropping, very early and extremely resistant to virosis and yellow rust. It is well suited to surfaces that are climate differentiated, It has, also, very high capacity to produce quality protein.

FULVIO wheat variety is part of bakery group 7. It is an early variety, which ensures constant productions, a high hectolitre mass and a high harvest quality. It has a good resistance to brown rust, to mildew and has a good tolerance to yellow rust. Medium - high trunk (100 cm).

LAURENZIO variety is a new variety of Premium wheat with very good protein quality use in the bakery industry. It has a very good wintering resistance. The plant height is 105 cm, it has a very good mildew resistance, good rust resistance and a medium yellow rust resistance. Protein content: 15-18%.

MIDAS wheat variety. Wheat variety of Premium genetics. It is very resistant to winter, with good twinning. and superior The production potential is superior and it has a medium height (100-105 cm). It is very productive, has a good quality. It is resistant to winter, resistant to dropping and drought and to mildew. This variety has constant bakery characteristics, regardless of climatic, potentially biological conditions: 10,000 - 13,000 kg/ha.

TAMINO wheat variety. It is a variety of autumn wheat, semi-early, with very good productive potential and very resistant to frost. The plants grows medium-sized, has a medium twinning capability. This variety has a very good tolerance to yellow rust and fusariosis. The grains have high hectolitre mass and a protein content of 15%, being part of Premium Grains Group.

In the laboratory the following determinations and analyzes were carried out: the mass of 1,000 grains; hectolitre mass; protein content and gluten content.

The mass of 1,000 grains (MMB) was established after harvesting for each variety. It was expressed in grams. It was determined as follows: a representative sample was taken from the seed mass, seeds were numbered randomly and grouped by 10, after which by 100 and then by 500 were grouped. The two samples of 500 were weighed separately and the results gathered. A mass of 1,000 seeds was thus obtained.

For determine the quality indicators (protein content, gluten and hectolitre weight), we used the Foss Infratec laboratory with a high precision instrument.

The working mode was carried out as follows: each of the samples was tested by means of a manual probe, the resulting sample was divided by means of the divider, and then sifted using a rectangular sieve of 2.2 mm. From the resulting sample, approximately 1kg was introduced into the Foss Infratec laboratory. After performing the analyzes, the results were displayed on the equipment display and on the analytical report printed attached to the equipment.

The calculation of production per ha was achieved by the rate of the weight of the grains harvested at the surface of the experimental plot to the area of one ha. The most important quality factor after production is the grain protein content which makes harvesting very valuable in terms of use.

RESULTS AND DISCUSSIONS

The protein content varies between 13.2% and 14.9%. The lowest content was recorded in the Midas variety, with a difference of -0.8% compared to the control and -1.2% against the average of variants, 14.4% (table 3). Fulvio and Tamino varieties obtained the highest value 14.9% recording an increase of 0.5% compare with the average. All varieties recorded values of protein content of over 14.0 % , except Midas variety.

Table 3. Influence of varieties and technology upon the protein content

Variety	Protein content %	Dif. to Mt %	Dif. to average %
Arnold - **Mt**	14	-	-0.4
Bitop	14.7	+0.7	+0.3
Fulvio	14.9	+0.9	+0.5
Laurenzio	14.5	+0.5	+0.1
Midas	13.2	-0.8	-1.2
Tamino	14.9	+0.9	+0.5
Average	**14.4**	-	-

Source: own calculation

Table 4. Influence of varieties and technology upon the gluten content

Variety	Gluten content %	Dif. to Mt %	Dif. to average %
Arnold - **Mt**	30.1	-	-1.5
Bitop	31.9	+1.9	+0.3
Fulvio	33.4	+3.4	+1.8
Laurenzio	32.8	+2.8	+1.2
Midas	29.1	-1.0	-2.5
Tamino	32.5	+2.5	+0.9
Average	**31.6**	-	-

Source: Own calculation.

Regarding the gluten content, compared to Arnold, where the value of 30.1% was recorded, Fulvio variety was marked by a plus of 3.4% (32.5%). Midas variety had 29.1%, with a minus of 1.0% below the control value and -2.5% below the average gluten content (Table 4). The average gluten content (31.6%) was exceeded by Bitop (31.9%), Fulvio (33.4%) and Tamino varieties (32.5%).

The value of the hectolitre weight and MMB of the varieties in experience are show in table 5 and table 6. Laurenzio variety has highest hectolitre weight, 81.6%, with a 3.5% increase over the control and 3.1% over the average of the studied varieties. Variant 2- Bitop, (75.6%) and variant 6- Tamino (75.7%) obtained the lowest values. The rest of varieties recorded values above 78.0 %, their average value being 78.9%.

Table 5. Influence of varieties and technology upon hectolitre weight

Variety	Hectolitre weight %	Dif. to Mt %	Dif. to average %
Arnold - **Mt**	78.1	-	-0.4
Bitop	75.6	-2.5	-2.9
Fulvio	79.4	+1.3	+0.9
Laurenzio	81.6	+3.5	+3.1
Midas	80.8	+2.7	+2.3
Tamino	75.7	-2.4	-2.8
Average	**78.5**	-	-

Source: Own calculation.

The values of mass of 1000 grains varied from 37.27 g, in the Fulvio variety and 49.52 g in the Tamino variety, with an average value of 45.79 g (Table 6).

Table 6. Influence of varieties and technology upon MMB

Variety	MMB G	Dif. to Mt g	Dif. to Average g
Arnold - **Mt**	47.4	-	+1.61
Bitop	47.82	+0.42	+2.03
Fulvio	37.27	-10.13	-8.52
Laurenzio	47.67	+0.27	+1.88
Midas	45.08	-2.32	-0.71
Tamino	49.52	+2.12	+3.73
Average	**45.79**	-	-

Source: Own calculation.

The production obtained under the soil and climate conditions of the year 2017, recorded values varying from 7,809.0 kg/ha to Fulvio variety and 8,985.0 kg/ha for Tamino variety(table 7). All the varieties analyzed recorded an

yield exceeded 7,000.0 kg/ha, the average value being 8,252.0 kg/ha. The best crop was obtained by Tamino variety, 14.2% against the control, with a crop efficiency of 1,117.0 kg/ ha, a very significant increase. Tamino variety also produced a very significant production difference (733.0 kg/ha) compared to the average (8,252.0 kg/ha). Tamino variety is follow by Midas variety, with a harvest of 8,572.0 kg/ha, wich means an increase of 8.9% compared to the witness and a plus crop of 704.0 kg / ha, very significant. The increase achieved by Midas variety was highly significant with a value of 320.0 kg/ha, compared to average (Table 7).

The varieties that recorded productions below the control value are Bitop (7,838.0 kg/ha), with a minus of 0.4% and Fulvio variety (7,809.0 kg/ha) with a minus 0.7%.

The Fulvio variety obtained a harvest minus, materialized in the production difference of 443.0 kg/ha, comparative with the average production, which in relative values materializes in a production minus of 5.4% (Figure 1).

Table 7. Influence of varieties and technology upon the yield

Variety	Production kg/ha	Difference to Mt %	Difference to Mt kg	Signific.	Diff. to average %	Diff. to average kg	Signific.
Arnold - **Mt**	7,868.0	Mt	Mt		-4.7	-384.0	00
Bitop	7,838.0	-0.4	-30.0	-	-5.0	-414.0	00
Fulvio	7,809.0	-0.7	-59.0	-	-5.4	-443.0	00
Laurenzio	8,439.0	+7.3	+571.0	***	+2.3	+187.0	-
Midas	8,572.0	+8.9	+704.0	***	+3.9	+320.0	**
Tamino	8,985.0	+14.2	+1,117.0	***	+8.9	+733.0	***
Average	**8,252.0**	-	-		-	-	

Dl 5%=216.13 kg/ha Dl 1%=307.23 kg/ha Dl 0.1 %=444.86 kg/ha
Source: Own calculation.

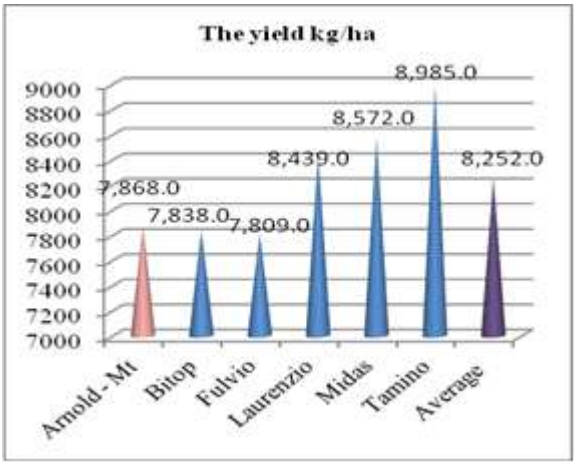

Fig. 1. Influence of varieties upon yield.
Source: Own calculation

CONCLUSIONS

Tamino and Fulvio varieties, recorded the highest protein content, 14.9%. Midas variety obtained the lowest protein content, 13.2%, below the witness value and the average value.

Fulvio variety recorded the hights content in gluten, 33.4% and Midas variety recorded the lowest content, 29.1%, which was the only variety that did not exceed the recorded variety and the average value.

Regarding the hectolitre weight, the highest value was recorded in Laurenzio variety, 81.6%. The lowest value was observed in Bitop and Tamino varieties, 75.7%, which are below the value of the control variety (78.1%) and the average (78.5%).

MMB exceeded the weight of 45 g for all varieties except for Fulvio variety, where MMB was 37.27 g, being the only one that did not exceed the calculated average value.

All varieties exceeded 7,800.0 kg/ha. The largest production belongs to Tamino variety, 8,985.0 kg/ha. The lowest yield was achieved in Fulvio variety, 7,809.0 kg/ha. This variety and Bitop variety had lower productions than those recorded in the control variety, but the differences were insignificant.

Very significant harvest differences were recorded by Laurenzio, Midas and Tamino varieties, production increases with values between 571.0-1,117 .0 kg/ha.

Compared to the average value, Arnold, Bitop and Fulvio varieties recorded distinctly significant negative productions. Midas variety made a distinctly significant harvest and Tamino variety was marked by a statistically significant increase (733.0 kg/ha).

All the tested varieties had good results, in the top being Tamino variety where the productions achieved, the protein and gluten content were balanced and superior to the other varieties.

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SOIL QUALITY ASSESSMENT OF DIFFERENT LAND USE TYPES IN SABONGIDA TAKAI NORTHEAST, NIGERIA

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Abstract

Soil quality assessment is imperative in determining the level of soil potential in order to ensure sustainable land use practices. The determination of the soil quality of Sabongida Takai Northeast Nigeria is essential hence it is an agrarian area. A free survey technique was used to cite profile pit on each of the four land use types selected for the study. The profile pits were sampled base on horizon differentiation and the samples were subjected to routine and special laboratory analyses. Generated data were statistically analyzed using one-way analyses of variance. Soil qualities were determined using Amacher soil quality index. The result indicated that sand fraction had the mean of 80.40 %, 79.55 %, 77.47 % and 56.80 % for the soil under dump site, farm site, residential site, and wetland site. The pH was high while total nitrogen, Mg, Na, K, total exchangeable acidity, Pb, and Cd were low according to the ratings of USDA NRSC soil quality index. The organic carbon was moderate at the dump site and farm site while it was low at the residential site and wetland site. Hence, the need to embark in soil management practices that will sustain the soil quality is imperative.

Key words**:** *assessment, horizon, profile pit, land use, soil quality, survey*

INTRODUCTION

Soil quality declination has been severe and on a widespread in most agricultural regions of the developing countries of the world [29]. Soil erosion and nutrient depletion are widely considered to be a significant soil degradation factors undermining the livelihoods of substances farmers in the developing world [35]. The result obtained from the assessment of soil quality will determine the kind of soil management practices which will be adopted in order to sustain or enhance the soil as the case may be for future use.

According to [19] soil quality is the inherent ability of a soil to function within an ecosystem boundary to sustain biological productivity, maintain air and water quality, and support human habitation and health. Soil quality consists of the diverse areas covering the inherent capacity of the soil for crop growth, and the dynamic part influenced by the soil user or manager [8, 33]. The physical, chemical, mineralogical and biological properties of soil determine the soil quality. However, individual soil properties alone may not be sufficient for the assessment of soil quality [3]. [39] stated that soil properties depend on the soil nutrient pools and reserves, which are altered by land use practices.

Soil quality decline also results in a reduction in global agricultural productivity, economic growth, and a healthy environment. Soil quality decline is caused by improper land use type, intense and erosive rainfall, steep terrain, deforestation, nutrient depletion, complete removal of crop residues, crop production with low levels of nutrient inputs, lack of adequate soil conservation practices, population pressure and overgrazing. In Nigeria, non-sustainable use of land has resulted in massive land degradation and soil

infertility [13, 40]. Agricultural producing region such as Sabongida Takai in Taraba State, the use of chemical fertilizers and pesticides for the sake of optimal production has been a practice over decades. According to [5, 10], the socioeconomic and political issues such as land tenure, capital, and infrastructural development have hastened the decline of soil quality. Soil quality data is important for appropriate decision making regarding sustainable land use practices. However, individual soil properties alone may not be sufficient for the assessment of soil quality. [15] stated that the assessment of soil properties is a basis for describing and understanding the status and qualities of the essential nutrients in soils. The assessment of soil physico-chemical properties helps agriculturist and other land users to understand the potential status of the soils.

Several researchers [1, 27] have reported on poor soil quality in most regions of Nigeria which are as a result of physical, chemical, mineralogical and biological properties. The decline in soil quality has a serious impact on soil physical, chemical and biological properties, especially, bulk density, infiltration, organic matter content, porosity and aggregate stability resulting in soil compaction and erosion [28, 32]. In Nigeria, there have been unregulated deforestation and intensive use of land for all kinds of land utilization type irrespective of the agricultural qualities of the soils or the environmental impact of these uses. [16] stated that soil quality assessment is imperative as the soil is a critically important component of the Earth's biosphere, supporting food production and environmental quality. There is a need to sustain food security and the quality environment through the use of proper soil management practices and policies. There is an increase in demand for information relating to soil conditions, their current status, level of degradation, changes due to land use types and management practices and suitable conservation practices to ensure sustainable and optimal land utilization. This would be ascertained through detailed soil quality assessment [20].

Although many works have been done on soil quality assessment of different land uses on soil properties and fertility around the world, yet little or nothing is done on soil quality in the study area. This facilitated this research work with the view of assessing the extent of soil quality as influenced by different land uses so as to guide the farmers and other land explorers. However, this study was to assess soil quality under different land use types in Sabon Gida Takai, Taraba State.

MATERIALS AND METHODS

Study area

The study was carried out in four different land use types located in Sabon Gida Takai in Gassol local government area of Taraba State North-east, Nigeria. The study area lies between latitude, 7º 31' N and 8º 4' N and longitude 10º 25' E and 11º 45' E. Sabon Gida Takai is in tropical continental with an annual rainfall range 866 – 1047 mm [25]. The average annual atmospheric temperature is about 34.22 ºC [25].

The study area is a rural community characterized by low to medium level of inputs based farmers. The major farmer produce are yam (*Dioscorea spp*), cassava (*Manihot esculenta Crantz*), melon (*Citrus valgaris*), rice (*Oryza sativa*), maize (*Zay mays*), sorghum (*Sorghum bicolor*), millet (*Pennisetum glaucum*), groundnut (*Arachis hypogeae*), and beans (*Cowpea spp*). Sabon Gida Takai lies along the Benue River and such its hydrology is influenced by the Benue River.

Study sites

The land use types consist of the Residential site, Farm site, Dumpsite, and Wetland site.

The dump site (landfill) is a site for the disposal of domestic waste of all kinds' waste materials. Landfills have been the most common method of waste disposal in the study area.

The farm site is an area of land which is set aside for the cultivation of annual crops which is the basic facility in food production in the study area. Various types of crops such as melon (*Citrus valgaris*), maize (*Zay mays*), okra (*Abelmosschus esculenta*), groundnut

(*Arachis hypogeae*), and yam (*Dioscorea spp*) are been cultivated here.

The wetland site of the study area is seasonally saturated with water. The primary factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique hydra soil. The wetland is basically used for rice production.

The residential site consists of private, industrial and commercial areas. Housing varies significantly between and through residential areas. These include private house, multi-family residential and single unit mobile houses.

Field study

A reconnaissance survey was conducted to map out the sites and to take into account the features within the area. Subsequently, a free survey technique was employed in citing soil profile pit on each of the land use types. However, samples were collected on each profile pit base on horizon differentiation as described by [31]. A total of 13 soil samples were collected. The collected soil samples were subjected to routine and special laboratory analyses.

Laboratory analyses

The particle size distribution was determined by the hydrometer method described by [14]. Soil pH was determined using 1:2.5 soil–water ratio using a pH meter [38]. Organic carbon was determined by wet digestion method [24]. Total nitrogen was determined by the micro-Kjeldahl digestion technique [7]. Available phosphorus was determined using Bray l method [26]. Exchangeable acidity was determined by the method described by [23]. Exchangeable bases were determined by neutral ammonium acetate procedure buffered at pH 7.0 [37]. Cation Exchange Capacity was determined using neutral ammonium acetate leachate method described by [36].

Statistical analysis

One-way analysis of variance (ANOVA) was used to compare the pedons under different land uses. Separation of the means of the soil properties of the pedons was performed using the least significant difference ($p<0.05$). However, the analyses were done using Genstat version 17th edition.

Soil quality assessment

Soil quality was determined using a direct approach as the result of the collected soil samples were placed in a quality index by matching soil characteristics with the soil quality index. Soil quality was estimated following the approach of [2] as indicated in Table 1. The estimation of the degree of soil quality was based on chemical and micronutrient parameters of the soil under the land use types.

Table 1.Soil quality ratings

Soil Properties	High	Moderate	Low	Very Low
pH	3.01 – 4.0	4.01 – 5.5	5.51 – 6.8	7.21 – 7.5
Organic Carbon (%)	>5	1 – 5	<1	
Total Nitrogen (%)	>0.5	0.1 – 0.5	<0.1	
Av.P (mg/kg)	>30	15 – 30	<15	
Na (cmol/kg)	>15	≤15		
K (cmol/kg)	>5	1 – 5	<1	
Mg (cmol/kg)	>5	0.05 – 5	<0.05	
Ca (cmol/kg)	>10	1.1 – 10	0.1	0.01
Al (cmol/kg)	>1	0.1 – 1	<0.1	
Zn (mg/kg)	>10	1 – 10	<1	
Cd (mg/kg)	>0.5	0.1 – 0.5	<0.1	
Pb (mg/kg)	>1	0.1 – 1	<0.1	

High= 2, Moderate= 1, Low= 0, Very Low= -1
Source: Adapted from Amacher *et al.* (2007) [2].

RESULTS AND DISCUSSIONS

The soil physical properties as shown in Table 2 indicated that sand fraction had a mean of 80.40 %, 79.55 %, 77.47 % and 56.80 % for the pedon under dump site, farm site, residential site, and wetland site. The sand fraction distribution of the study area could be

associated with parent material and climatic factors. This agreed to the finding of [18] in soils of Northeast Nigeria. Sand fraction for the pedon under the dump site differed significantly ($p< 0.05$) with that of the pedon under the wetland site while sand fraction for the pedon under the dump site had non-significant difference with the pedon under the farm site and residential site. The silt fraction for the pedon under wetland site differed significantly ($p< 0.05$) with that of the pedon under farm site and residential site while it had a non-significant difference with the pedon under dump site.

Clay fraction had a mean of 14.0 %, 14.0 %, 17.0 % and 24 % for the pedons under dump site, farm site, residential site, and wetland site. However, clay fraction had a non-significant difference among the land-use types. The silt-clay ratio of pedons under dump site, farm site, and residential site were higher than 0.15 which is an indication that the soil is formed from new parent material hence the silt-clay ratio for wetland site is < 0.15. However, [4] stated that soil with silt-clay ratio < 0.15 are derived from old parent material and are highly weathered. According to [21], soils that are highly weathered are easily degraded. Silt-clay ratio of the pedon under wetland site differed significantly ($p< 0.05$) with that of the pedon under the farm site and it had non-significant difference with the silt-clay ratio of the pedon under dump site and residential site.

Table 2. Soil physical properties of the studied sites

Horizon	Depth (cm)	Sand (%)	Silt (%)	Clay (%)	TC	SCR
DUMP SITE (coordinate: 8°20.14′ N and 10°26.19′ E; elevation: 178.4 m)						
A	0–13	83.8	6.2	10.0	LS	0.62
AB	13–27	84.8	5.2	10.0	LS	0.52
BA	27–45	86.8	3.2	10.0	LS	0.32
Bt1	45–65	83.8	3.2	13.0	LS	0.25
Bt2	65–97	67.8	5.2	27.0	SCL	0.19
Mean		**81.40^{a}**	**4.6^{ab}**	**14.0**		**0.38^{ab}**
FARM SITE (coordinate: 8°19.93′ N and 10°26.17′ E; elevation: 181.8 m)						
A	0–13	86.8	4.2	9.0	LS	0.47
AB	13–37	85.8	5.2	9.0	LS	0.58
Bt1	37–59	78.8	8.2	13.0	LS	0.63
Bt2	59–88	66.8	8.2	25.0	SCL	0.33
Mean		**79.55^{ab}**	**6.45^{a}**	**14.0**		**0.50^{a}**
RESIDENTIAL SITE (coordinate: 8°19.99′ N and 10°26.15′ E; elevation: 179.5 m)						
A	0–25	84.8	5.2	10.0	LS	0.52
AB	25–51	84.8	4.2	11.0	LS	0.38
Bt	51–112	62.8	7.2	30.0	SCL	0.24
Mean		**77.47^{ab}**	**5.53^{a}**	**17.0**		**0.38^{ab}**
WETLAND SITE (coordinate: 8°19.77′ N and 10°26.19′ E; elevation: 176.8 m)						
A	0–50	56.8^{b}	1.2^{b}	24.0	SCL	0.05^{b}
LSD(0.05)		**23.58**	**4.098**	**20.96^{NS}**		**0.3928**

TC= textural class, SCR= silt clay ratio, LS= loamy sand, SCL= silt clay loam, ^{NS}= not significant, LSD= least significant difference
Source: Own results.

The soil pH (Table 3) was slightly acidic in all the pedons of the land uses. The soil pH had no significant difference among the pedons of the land-use types. The soil pH level could be associated with anthropogenic activities and the nature of parent material. The organic carbon content of pedons under the dump site and farm site was moderate while that of the pedon under the residential site and wetland site was low according to the ratings [22] and [12]. The organic content differed non-significantly among the pedons under the land-use types. However, total nitrogen had non-significant difference among pedons of the land-use types. The available phosphorus of the pedons was high at the dump site,

moderate at the residential site and wetland site and low at the farm site when compared with the rating of [11]. The high available phosphorus at the dump site could be attributed to the activities of organic matter content deposit. Available phosphorus for the pedon under the dump site differed significantly ($p< 0.05$) with that of the other pedons of the land-use types while available phosphorus for the pedon under farm site, residential site, and wetland site differed non-significantly. The carbon-nitrogen ratio had a mean of 20.58 for the pedon under the dump site, 7.81 for the pedon under the farm site, 2.58 for the pedon under the residential site, and 0.81 for the pedon under the wetland site. The carbon-nitrogen (C:N) differed non-significantly among pedons of the land-use types. According to [6], if C:N exceeds 25:1 this will result to N deficiency thereby reducing the rate of organic matter decomposition hence the microbes do not have sufficient N to sustain their life.

Table 3. The results of soils pH, organic carbon, total nitrogen, available phosphorus, Calcium nitrogen ratio under the studied sites

Horizon	Depth (cm)	pH (H_2O)	OC (%)	TN (%)	Av.P (mg/kg)	C:N
DUMP SITE (coordinate: 8º20.14′ N and 10º26.19′ E; elevation: 178.4 m)						
A	0–13	5.65	6.67	0.15	97.76	44.46
AB	13–27	5.15	3.72	0.21	92.24	17.71
BA	27–45	6.3	3.49	0.09	124.22	38.78
Bt1	45–65	6.65	0.12	0.10	54.76	1.20
Bt2	65–97	6.75	0.12	0.16	58.07	0.75
Mean		**6.10**	**2.82**	**0.14**	**85.41[a]**	**20.58**
FARM SITE (coordinate: 8º19.93′ N and 10º26.17′ E; elevation: 181.8 m)						
A	0–13	6.55	2.43	0.22	8.49	11.05
AB	13–37	6.6	1.24	0.17	0.37	7.29
Bt1	37–59	6.5	2.17	0.18	0	12.06
Bt2	59–88	6.65	0.17	0.2	0	0.85
Mean		**6.58**	**1.50**	**0.19**	**2.21[b]**	**7.81**
RESIDENTIAL SITE (coordinate: 8º19.99′ N and 10º26.15′ E; elevation: 179.5 m)						
A	0–25	6.65	0.81	0.23	8.09	3.52
AB	25–51	6.75	0.17	0.14	14.7	1.21
Bt	51–112	6.45	0.57	0.19	12.13	3.00
Mean		**6.62**	**0.52**	**0.19**	**11.64[b]**	**2.58**
WETLAND SITE (coordinate: 8º19.77′ N and 10º26.19′ E; elevation: 176.8 m)						
A	0–50	6.00	0.17	0.21	11.76[b]	0.81
$LSD_{(0.05)}$		**1.147[NS]**	**4.818[NS]**	**0.1012[NS]**	**48.64**	**34.64[NS]**

OC= organic carbon, TN= total nitrogen, Av.P= available phosphorus, C:N= calcium nitrogen ratio, [NS]= not significant, LSD= least significant difference
Source: Own results

According to the ratings of [22] as indicated in Table 4, Ca and Mg content was very low and low, respectively; Na content was high-very high while K content was very high for pedon under the land-use types except for the wetland site where it was moderate. The Na content was predominant than other basic cations in all the pedons under the land-use types except for wetland site where Ca content dominates the pedon. The Mg, Na, and K had a non-significant difference among the pedons under the land-use types. However, Ca content for the pedon under dump site and wetland site differed significantly ($p< 0.05$) with that of the pedon under the farm and residential land use types. The effective cation exchange capacity (ECEC) had a mean of 11.12 cmol/kg for the pedon under the dump site, 12.47 cmol/kg for the pedon under the farm site, 16.80 cmol/kg for the pedon under the residential site, and 12.49 cmol/kg for the pedon under the wetland site. However, ECEC (Table 4) differed significantly among the pedons under

the land-use types. The calcium-magnesium ratio had a mean of 1.29, 1.23, 1.26 and 1.67 for the pedons under dump site, farm site, residential site, and wetland site, respectively. The Ca:Mg is <3 which indicates that the soils are infertile as described by [22] for tropical soils.

Table 4. The results of soils Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Total exchangeable bases and Effective cation exchange capacity under the studied sites

Horizon	Depth (cm)	Ca (cmol/kg)	Mg (cmol/kg)	Na (cmol/kg)	K (cmol/kg)	TEA (cmol/kg)	ECEC (cmol/kg)	Ca:Mg
DUMP SITE (coordinate: 8°20.14′ N and 10°26.19′ E; elevation: 178.4 m)								
A	0–13	0.87	0.65	2.17	1.41	2.4	7.50	1.34
AB	13–27	0.87	0.67	4.35	1.66	4.0	11.55	1.29
BA	27–45	0.89	0.69	5.22	1.99	1.6	10.39	1.29
Bt1	45–65	1.09	0.7	4.35	1.53	2.4	10.07	1.56
Bt2	65–97	0.78	0.81	8.70	4.60	1.2	16.09	0.96
Mean		**0.90^{b}**	**0.70**	**4.96**	**2.24**	**2.3^{b}**	**11.12**	**1.29^{ab}**
FARM SITE (coordinate: 8°19.93′ N and 10°26.17′ E; elevation: 181.8 m)								
A	0–13	0.78	0.63	0.96	0.36	2.0	4.73	1.24
AB	13–37	0.78	0.64	0.96	0.36	4.8	7.54	1.22
Bt1	37–59	0.79	0.64	6.52	1.29	12.0	21.24	1.23
Bt2	59–88	0.82	0.66	4.35	2.56	8.0	16.39	1.24
Mean		**0.79^{b}**	**0.64**	**3.20**	**1.14**	**6.70^{a}**	**12.47**	**1.23^{b}**
RESIDENTIAL SITE (coordinate: 8°19.99′ N and 10°26.15′ E; elevation: 179.5 m)								
A	0–25	0.86	0.64	6.52	2.43	6.4	16.85	1.34
AB	25–51	0.88	0.66	0.91	0.33	8.8	11.58	1.33
Bt	51–112	0.82	0.73	8.70	3.71	8.0	21.96	1.12
Mean		**0.85^{b}**	**068**	**5.38**	**2.16**	**7.73^{a}**	**16.80**	**1.26^{b}**
WETLAND SITE (coordinate: 8°19.77′ N and 10°26.19′ E; elevation: 176.8 m)								
A	0–50	1.27^{a}	0.76	1.22	0.44	8.8^{a}	12.49	1.67^{a}
LSD$_{(0.05)}$		**0.1943**	**0.1182^{NS}**	**7.261^{NS}**	**3.329^{NS}**	**6.56**	**13.57^{NS}**	**0.3834**

TEA= total exchangeable acidity, ECEC= effective cation exchange capacity, ^{NS}= not significant, LSD= least significant difference
Source: Own results.

Available Zn (Table 5) was very low among the pedons under the land-use types according to the rating of [9]. The available Zn was low compared to the findings of [34] in soils of Northeast Nigeria. However, available Zn of the pedon under the farm site differed significantly ($p < 0.05$) with that of the pedons under dump site, residential site, and wetland site. However, available Zn had non-significant difference among the pedons under the dump site, residential site, and wetland site.

The available Pb (Table 4) ranged from 0.001 – 0.003 mg/kg among pedons of the land-use types. The available Pb and available Cd were within the tolerable limit recommended by [41]. Available Pb and Cd had non-significant difference among pedons under the land-use types.

Available Cr ranged from 0.008 – 0.018 mg/kg among pedons under the land-use types. The available Cr was below the tolerable limit for soil as recommended by [41]. The available Cr of the pedon under wetland site differed significantly ($p < 0.05$) with that of pedons under dump site, farm site, and residential site.

The soil quality index (Table 1) as designed by [2] was used to determine the quality of soil as influenced by the land use types.

The pH (Table 6) of the horizons of each pedon under the land use types was moderate except for the AB horizon of the dump site pedon that was high. However, the A horizon of the pedons under each land use type is suitable for many plant species when compared with the rating of soil quality index [2].

Table 5. Selected Heavy metal Properties of the studied sites

Horizon	Depth (cm)	Zn (mg/kg)	Pb (mg/kg)	Cd (mg/kg)	Cr (mg/kg)
DUMP SITE (coordinate: 8°20.14′ N and 10°26.19′ E; elevation: 178.4 m)					
A	0–13	0.023	0.008	0	0.024
AB	13–27	0.024	0.002	0	0.020
BA	27–45	0.024	0.002	0	0.016
Bt1	45–65	0.026	0.002	0	0.012
Bt2	65–97	0.023	0.001	0	0.018
Mean		**0.024[b]**	**0.003**	**0**	**0.018[a]**
FARM SITE (coordinate: 8°19.93′ N and 10°26.17′ E; elevation: 181.8 m)					
A	0–13	0.031	0.001	0.001	0.012
AB	13–37	0.030	0.002	0	0.010
Bt1	37–59	0.028	0.001	0	0.008
Bt2	59–88	0.031	0.001	0	0.010
Mean		**0.030[a]**	**0.001**	**0.00**	**0.010[a]**
RESIDENTIAL SITE (coordinate: 8°19.99′ N and 10°26.15′ E; elevation: 179.5 m)					
A	0–25	0.024	0.002	0.001	0.014
AB	25–51	0.022	0.001	0	0.009
Bt	51–112	0.024	0.002	0	0.012
Mean		**0.023[b]**	**0.002**	**0.00**	**0.012[a]**
WETLAND SITE (coordinate: 8°19.77′ N and 10°26.19′ E; elevation: 176.8 m)					
A	0–50	0.022[b]	0.001	0.0009	0.008[b]
LSD(0.05)		0.003163	0.004775[NS]	0.00098[NS]	0.0083

Source: Own results.

Table 6. Soil quality rating of the studied pedons

Horizon	Depth (cm)	pH H_2O	OC %	TN %	Av.P (mg/kg)	Ca (cmol/kg)	Mg (cmol/kg)	Na (cmol/kg)	K (cmol/kg)	TEA (cmol/kg)	Zn (mg/kg)	Pb (mg/kg)	Cd (mg/kg)
DUMP SITE (coordinate: 8°20.14′ N and 10°26.19′ E; elevation: 178.4 m)													
A	0 –13	0	2	1	1	-1	1	1	1	1	0	1	1
AB	13–27	1	1	1	1	-1	1	1	1	1	0	1	1
BA	27–45	0	1	0	1	-1	1	2	1	1	0	1	1
Bt1	45–65	0	0	1	1	0	1	1	1	1	0	1	1
Bt2	65–97	0	0	1	1	-1	1	2	1	1	0	1	1
Mean		**0**	**1**	**1**	**1**	**-1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**
FARM SITE (coordinate: 8°19.93′ N and 10°26.17′ E; elevation: 181.8 m)													
A	0–13	0	1	1	1	-1	1	1	1	1	0	1	1
AB	13–37	0	1	1	0	-1	1	1	1	1	0	1	1
Bt1	37–59	0	1	1	0	-1	1	2	1	2	0	1	1
Bt2	59–88	0	0	1	0	-1	1	1	1	1	0	1	1
Mean		**0**	**1**	**1**	**0**	**-1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**
RESIDENTIAL SITE (coordinate: 8°19.99′ N and 10°26.15′ E; elevation: 179.5 m)													
A	0–25	0	0	1	0	-1	1	2	1	1	0	1	1
AB	25–51	0	0	1	1	-1	1	1	1	1	0	1	1
Bt	51–112	0	0	1	1	-1	1	2	1	1	0	1	1
Mean		**0**	**0**	**1**	**1**	**-1**	**1**	**2**	**1**	**1**	**0**	**1**	**1**
WETLAND SITE (coordinate: 8°19.77′ N and 10°26.19′ E; elevation: 176.8 m)													
A	0–50	0	0	1	1	0	1	1	1	1	0	1	1

OC= organic carbon, TN= total nitrogen, Av.P= available phosphorus, TEA= total exchangeable acidity
Source: Own results.

The organic carbon (Table 6) content of the horizons of the pedons under the dump site and the farm site were mostly moderate except at the A horizon of dump site pedon where it was high. The organic carbon content of Bt2 horizon of the farm site pedon, the residential site, and the wetland site were low when compared with the USDA soil quality index. Anthropogenic activities and land management practices can result in a decrease in organic carbon level [30, 42]. The total nitrogen content (Table 6) of the horizons of the pedons under the land use types was moderate except for the BA horizon of dump site pedon where it was low. Available phosphorus was moderate across the horizons

of pedons of the dump site and wetland site. However, available phosphorus was moderate at the A horizon and low in other horizons of Farm site pedon while, it was low at the A horizon and moderate at other horizons of residential site pedon. The Ca content was deficient in all the horizons of the pedons under the land use types. Ca depletion has been identified as a threat to soil sustainable productivity [17]. The Mg, K, and total exchangeable acidity were moderate across the horizons of the pedons under the different land use types. The total exchangeable acidity was moderate and as such could affect Al-sensitive plants as suggested by [22]. The Na content was moderate across the A horizon of the pedons except for that of the residential site that was high. Available Zn was low while available Pd and Cd were moderate across the horizons of each pedon under the land use types. The availability of Zn, Pb, and Cd as indicated in Table 6 was not a threat to the soil and its environment. However, Zn, Pb, and Cd become more available as pH increases. Hence, the pH levels of soil are not suitable to enhance the availability of the metallic cations.

CONCLUSIONS

The soil quality indicates that the soil pH is suitable for most land use practices. The organic carbon, total nitrogen, and available phosphorus were predominantly moderate and as such require some soil management practices to enhance their availability in soil. The Na content was moderate hence requires proper management in order to avert the occurrence of soil salinity. The available Zn, Pb, and Cd are no threat to underground water and also the crops that were grown within the area. The overall rating indicated that the soils of Sabon Gida Takia have moderate quality. However, practices that will enhance soil biodiversity, soil nutrient pool, alleviation of acidification and decreasing of salinization should be encouraged. These could be achieved through; incorporation of organic matter into the soil, use of non-acidic fertilizer, use of liming material as the need arises, and application of pesticides as recommended.

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THE NEED FOR THE VOLUNTARY QUALITY CERTIFICATION SCHEMES IN FOOD INDUSTRY. A CRITICAL OVERVIEW ON DUAL-STANDARD ISSUE

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Abstract

This paper examines the issue of the dual standard for food products and proposes measures to combat these unfair practices. There is an ongoing debate on dual-quality as current problems dealing in food sector with significant effects on products quality, consumer's information and producer's practices, especially the multinational. With this paper, we contribute to this debate by providing by addressing several important shortcomings and gaps in the existing literature. Among the various issues in this field, the approaches addressed is this paper are: (I) an analysis of the European and Romanian situation regarding the voluntary quality certification systems; (II) concrete answers how voluntary certification schemes of food can provide a functional solution for correct consumer information. The dimension of the approach is European, given that multinational producers operating on several markets are targeted. Identical Package - Different Composition is it a fraud or lack of morality?

Key words**:** *food quality, European certification systems, dual-quality, unfair practices*

INTRODUCTION

Food supply chains and food quality and safety assurance becomes an important public concern all over the World along with the unprecedented fast economic growth. Due to the technical and demographic changes [9, 15, 12, 4], in the last period of time, the food chains for human consumption have undergone considerable changes [5, 13].

However, WHO (2015) explained that the complexity of the food chain is based on demographic, cultural, economic, and technological developments [2, 10]. Kleboth et al. (2016) suggested that today's food sector is a conglomerate of international, fast changing, and interdependent networks (WHO, 2015), which follow consumer trends, innovations and societal developments [9, 14]. However, globalization of trade has brought quality attributes of consumption goods under the limelight [1].

Consumers and public authorities are giving weight to quality attributes such as nutritional content, safety, functionality, and social and environmental impact [1].

The increase in the number of quality assurance schemes was due to the effort to ensure food safety, but also the quality of the products, which has been achieved both internationally and at the level of the U.E [3]. According to Jervell and Borgen (2004), he points out the need and usefulness of these schemes for consumers, but also playing an important role in marketing, allowing producers to differentiate themselves in the market and add value to their products.

The international ISO 9000 and ISO 22 000 families of norms address, respectively, product and process certifications, the first

linked mostly to consumption, the second linked mostly to production [8, 15].

This paper proposes an analysis of the European and Romanian situation regarding the voluntary quality certification systems, in order to finally propose the introduction in the national rural development policy of European mechanisms and instruments adapted to the Romanian producers and to the national market. The main objectives of the discussion are to create material benefits for producers and to increase consumer confidence in Romanian agri-food products. Additionally, some critical comments on double standards with the main purpose of bringing into attention some specific and current problems dealing in food sector are presented. The comments can provide a basis for discussions about the usefulness of introducing voluntary quality schemes both as a marketing tool for food producers and as a tool for promoting food quality and market transparency for consumers.

MATERIALS AND METHODS

The methods used in this research include analysis of collected materials, government sources, and academic sources. Government sources include the European Union Regulations, Ministry of Agriculture and Rural Development and Romanian National Institute of Statistics. For the dependent variables, the archived materials were compiled and referenced. The collection of information consisted of the verification of the current literature, but also of the administrative norms, both at national and at European level.

RESULTS AND DISCUSSIONS

In the consumer's perception, the quality of the food is defined by the taste experience and complemented by elements such as the origin, the method of production and how healthy the product is [6].

Grunert and Aachmann (2016) state that these elements are unknown to the consumer, prior to purchase, they determine to use quality as a guide to form expectations about the quality of a product [7].

Usually, the consumer perceives the quality according to the following indicators: price, appearance, brand, but also the store where the product is sold.

The main purpose of these quality schemes is to encourage diverse agricultural production, to protect product names from inappropriate use and fraud, and help consumers in informed decision- making [11, 17].

The applications for the quality scheme labels, presented in Figure 1, are usually handed over through the Food National Authorities to the European Commission, which analyzes and processes the applications and grants the right of use.

Fig. 1. PDO, PGI and TSG labels
Source: [14]

On July 16, 2019, 1.451 products have been registered as fulfilling the criteria and hence have the right to use one of the labels. Of these, 639 are PDO, 751 are PGI and 61 are TSG. A distribution of quality certification schemes by type is presented in Figure 2.

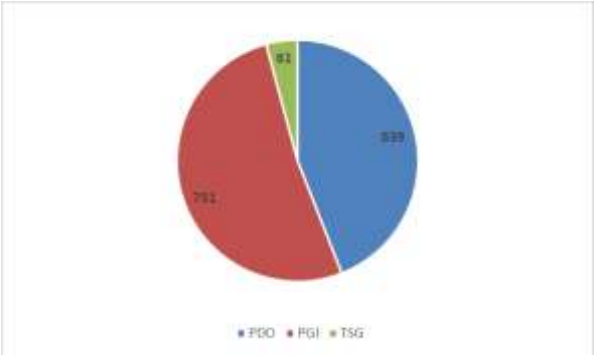

Fig. 2. Number of quality certification schemes by type
Source: https://ec.europa.eu/agriculture/quality/door/list.html?locale=ro, Accessed on 01.05.2019.

The geographical distribution is heavily skewed towards Southern Europe [7].

Most registrations are found in Italy (299), France (249) and Spain (196), compared to only a few registered products in Denmark (7) and Sweden (8). Unfortunately, Romania has 5 products registered, as follows: Novac afumat din Ţara Bârsei, Telemea de Ibăneşti, Salam de Sibiu, Magiun de prune Topoloveni and Scrumbia de Dunare Afumată [15].

Critical overview

Following the model of the society described by George Orwell in his famous novel "Animal Farm", BREXIT has introduced the idea of a two speed Europe and the notion that all European countries are equal, but some countries are more equal than others. Most of the time the equality of the countries is measured based on GDP per capita. Starting the '90s, the multinational companies have "adapted" their product offer based on the financial potential of the destination market but keeping the same name and visual identity of the product. In a single European market where products and citizens circulate freely, the differences in standards have been noticed by authorities in countries whose markets have been delivered with different qualities of the original product, asking for explanations for transnational manufacturers. The press, to describe the phenomenon, introduced the term double-standard or dual quality. This neologism comes from English and describes an unequal treatment, preferentially applied to a standard, which should obviously have a unique character. Can we talk about a consumer deception or a lack of morality of the producer towards the consumer? EU rules only address those aspects of food safety and have not intervened so far in the quality policy of producers, leaving Member States the possibility to regulate these issues with strict reference to their own markets.

Between 19 and 26 of June 2017, Romania has sent a joint team of specialists from food engineering, health and food safety to take food sample in Maastricht (The Netherlands), Aachen (Germany) and Brussels (Belgium). The similar food products were collected from the shelves of the countries concerned: Lidl - Germany and the Netherlands; Kaufland - Germany; Belgium - Delhaize (Mega Image-Romania). The samples were handled by the Institute for Hygiene and Veterinary Public Health Bucharest, belonging to The National Sanitary Veterinary and Food Safety Authority, in order to make the following analysis: physic-chemical analysis for meat, milk, fish and chocolate and the presence of vegetable fats in milk and milk products. The results are presented in Table 1. Of the 29 samples analyzed, differences were found in 9 of these (Table 1).

Table 1. Analytical results of the comparative study

No.	Product name in RO	Product name in EU	Value declared on the label (kcal/100 g)	Value products RO (kcal/100 g)	Value products EU (kcal/100 g)
1	Pork parizer	Pork parizer Germany	279	259.09	274.32
2	Barbecue sausages	Barbecue sausages Germany	280	254.61	282.46
3	Canned fish	Canned fish Germany	377	307.84	210.34
4	Paté	Paté Czech Republic	238	259.98	273.54
5	Bacon cubes	Bacon cubes Belgium	233	278.58	192.14
6	Pork ham	Pork ham Germany	222	306.38	230.36
7	Canned mackerel	Canned mackerel France	13.6	20.7*	22.05*
8	Canned herring	Canned herring Germany	13	21.96*	20.36*
9	Canned mackerel	Canned mackerel France	55.11	42.87*	47.8*

Source: [17].

Dirk Jacobs, Deputy Director General and Director of Consumer and Food Information at Food Drink Europe (FDE) told interested parties that different recipes do not necessarily mean dual quality. However, the igloo fish sticks sold in Slovakia, UK, Netherlands and Portugal have a lower fish content (58%) than the same branded product in Austria (65%). The refreshing drink Coca-Cola, has significant differences in taste between the two countries, so that in Slovakia, the taste is slightly sweet, while in Austria it is sweet. Included are differences on the label, so that in Slovakia fructose-glucose syrup is used, while in Austria sugar is used. At the same time black tea Earl Gray, in Austria tea bags are made of aluminum, while in Slovakia they are made of paper.

Emmental cheese, in Slovakia, does not have the usual structure, having a light yellow color and a different texture, while in Austria it has the normal appearance, color and texture. (Figure 3).

Fig. 3. Emmental cheese in Slovakia and Austria
Source: [16].

In the case of the mozzarella cheese, the net weight of the product on the label is 125 g. In Slovakia, the weight is 119.4 g, while in Austria is 124 g. According to a study conducted by InfoCons, differences were identified in the list of ingredients for Fanta Orange Drink - a carbonated soft drink with orange juice. In the case of soft drinks, following the analysis of products from three countries, differences were noted regarding the fruit juice content, as follow: in Romania: minimum 5% orange juice from the concentrate; in Great Britain 3.7% orange juice and 1.7% citrus juice from concentrate; Are voluntary quality certification systems viable solutions to respond to these issues? Increased transparency to consumers regarding companies (national, international or transnational) standards applied to identical products on different markets must be legislated at EU level?

It is clear that food safety is regulated by European legislation specific to each field, the breach of legislation by producers who manufacture and sells products on European territory is fraud and is punishable under the law. Food safety legislation changes according to the information obtained from scientific studies received from national and European agencies, on factors that can affect the health of the population, animals and plants. However, quality is an extremely subjective notion when it is not related to a reference analysis. The manufacturing standard used by manufacturers and communicated to control authorities when performing physic-chemical, organoleptic, nutritional analyses etc. is such a referential for an objective analysis of product quality parameters. Violation of the parameters stated in these manufacturing standards is

considered a contravention and is punishable under the consumer protection legislation.

The question is how do act when the product complies with all the safety and quality parameters present in the manufacturing standard, but analyzes made on identical products taken from different countries show variations greater than 2%? An example would be the percentage of fat content for a sausage, with a maximum limit of 50%, while the analysis shows that in the Western Europe the percentage is 20%, while in Eastern Europe the percentage rises to 49%? Or what should be done when in Germany, a producer uses pork meat as raw material for a canned product, while in the Czech version, the mechanically deboned meat from poultry is used?

At national level, a first step in this direction was made by establishment of the Agency for Quality and Marketing of Food Products, which aims at providing strategies for the development of the sector. The main objective of the Agency will be to increase the number of quality systems recognized at European level for Romanian products and certification according to voluntary certification systems in order to promote the quality of the Romanian food products.

CONCLUSIONS

The answer is one, namely increasing the transparency of product-related information, by increasing the volume of data present on the label. However, sometimes this is not enough and therefore all the manufacturers should publish the manufacturing standards for the products marketed either on their own internet site or on the websites of the authorities in the countries where they market the products. In this way, consumers either directly or through their representatives at the associative level can inform or conclude before purchasing the product. Also, the actions of small and medium-sized producers from regional or national level, who will try to value their own products through fair comparative consumer information will not be neglected.

In this way the market will be adjusted and the consumer will penalize the lack of morality through the lack of acquisition, while companies using these unfair practices will be obliged to correctly inform consumers either by selling quality identical products or by changing the names of different qualitative products. Another solution is to encourage small and medium-sized regional or national producers to apply for national or European quality systems, thus securing the established product designations to a single standard. Voluntary quality certification guarantees consumers compliance by the manufacturer with a public-quality standard. A fair price for a fair product.

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THE IMPACT OF RELIGIOUS TRADITIONS ON CONSUMERS' BEHAVIOUR AND FOOD PRODUCTS' CERTIFICATION

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Abstract

The paper aimed to present the impact of religious traditions on consumers' behaviour and food products certification. The Orthodox religion is specific to Romania, but also in other countries from ten Eastern and Southern Europe. The POST (to refrain you from eating food and beverages containing animal protein and form sins) products can play an extremely important role on the market segment represented by the voluntary quality certifications in the traditional - religious system, which is due to the numerous Christian-Orthodox believers, who strictly respect the customs and traditions mentioned in the specific documents of the religion. The number of quality schemes differs from country to country, depending on the importance they attach to them and to the products marketed.

Key words**:** *products, post, quality, quality schemes*

INTRODUCTION

In 2015, Christians held the highest share of all religious groups, with a share of 31.2% (Table 1.). [9]

Table 1. Situation of religious groups worldwide in 2015 [9]

Religion	Year 2015
	U.M: billions persons
Christians	2.3
Muslims	1.8
Unaffiliated	1.2
Hindus	1.1
Buddhists	0.5
Folk religions	0.4
Other religios	0.1
Jews	0.01

Source: Hackett, C., Mcclendon, D., 2017, Christians remain world's largest religious group, but they are declining in Europe.

Muslims also had a share of 24.1%, respectively Hindus of 15.1% of the total religious groups (Table 1.). [9]

Table 2. Situation of the religious groups in Romania [12]

Religion	Years			
	2002		2011	
	thousands	%	thousands	%
Total of which:	21,681.0	100	20,121.641	100
Orthodox	18,818.0	86.8	16,307,004	86.5
Roman-Catholic	1,026.4	4.7	870,774	4.6
Reformed	701.1	3.2	600,932	3.2
Pentecostal	324.5	1.5	362,314	1.9
Greek-Catholic	191.6	0.9	150,593	0.8

Source: Negruti, S., 2014, The evolution of the religious structure in Romania since 1859 to the present day, Revista de Statistica, Supllement No.6, 39-46.

At the level of 2011, the number of people whose religious orientation was orthodox stood at over 16 million, also holding 86.5%, followed by Roman Catholics, whose share was only 4.6% (Table 2) [12].

During the year, the Orthodox Christians guide their religious life according to certain holidays, considered smaller or higher depending on the importance of the event they bring for relocation and commemoration. In essence, these celebrations are nothing more than occasions for the encounter of man with God and the saints, as foreshadows and anticipations of the full communion to which we aim, in the Kingdom of Heaven, at the end of time. Taking into account this tension between the expectation of the full life of the "age to be" and its preparation from this stage of existence, the life of the Orthodox Christian is laid out, besides holidays and related to them, for periods or single days of fasting [2, 7].

Fasting, as a total or partial abstention from food and drink, for a longer or shorter time, but also as far as possible from sins, is the most appropriate means, found by the Church, to express the ephemerality of this life and the expectation to another, in full communion with God and with others. Thus, Christians, by fasting, express their status as pilgrims in this life, but also the state of dependence on God, from whom they are all. Besides this character, of manifesting the expectation of a meeting or an important event, the post (to refrain you from eating food and beverages containing animal protein and form sins) also has a cleaning purpose, both physically and soulfully, a role of managing, through braking, the capacities of the body and mind, but also a cultic role, by the way in which we show our honor to God or one of His saints.

Starting from the scriptural and patristic examples and words regarding the fasting, the Church has sought, since ancient times, from the apostolic period, to establish, according to needs, certain regulations regarding the practice of fasting. The ordinances established in the Church had and are intended to help the personal godliness of the believers so that it is not without some discipline and uniformity, that, starting from a general rule, each, with the counsel of the spiritual, choose the position which is theirs most useful. This is why, from the Holy Apostles up to the present day, certain typical canons and guidelines regarding the position have been established in the Orthodox Church [5, 6].

A more thorough categorization of the job types can be achieved. Thus, taking into account his harshness, the post is of four types: [14, 17, 18, 19].

a) Integral (total) fasting or actual fasting, which consists in complete abstention from any kind of food and drink for a certain time (which obviously cannot be too long); it is the post held by Moses on Sinai [Exodus 24, 18], by the Prophet Elijah [III Kings 19, 8] and the Savior Jesus Christ before coming to preaching [Luke 4, 1-2]. It is about the full post which we have mentioned before and which must invariably precede the Sacrament of the Holy Eucharist, as can be seen from Canon 41 and 47 of the Cartagena Synod of 419;

b) The black, rough or dry fast (xirophagy), which allows only the consumption of dry or raw food: bread, seeds, fruits and vegetables, dried or raw. It is the position practiced by Saint John the Baptist [Matthew chap. 3; Mark head. 1], but also of the great ascents and Christian hermits;

c) The common (ordinary) station, in which the consumption of cooked foods, of vegetable origin (implicitly also the oil) is allowed, excluding any food of animal origin, called in the people "sweet" or "fruit" (meat, including fish, animal fat, eggs, milk and all its derivatives). It is the position practiced by most believers, usually;

d) Easy fasting, also called a breakdown (Greek = κατάλυσις, Slavic-Russian = razrazani), which allows the consumption of fish (including so-called "seafood"), wine, and oil, during periods when it is imposed on rough post. These kinds of disclosures are given for the larger holidays that fall during the fasting days, being regulated in detail in books that contain liturgical-typical ordinances, such as "Ceaslovul Mare", "Tipicul Mare", "Triodul" or mines.

Before making a more in-depth analysis of the foods to be relinquished to hold the post in good order, some essential clarifications must be made in the correct understanding of the principles that guide the phenomenon of fasting in the Orthodox Church. If we were to look after the canonical collections, in the Apostolic Canoes, considered to be the earliest, before making any further details regarding the post, there are two references that regulate precisely how one should relate to the things that are subject to braking. It is about canons 51 and 53 Apostolic. This is the text of the first, the second being similar: "If any bishop or priest or deacon, or anyone in the priestly catalog (supper), is kept away (would abstain) from the wedding and from the flesh and wine, not for braking , but out of the bush, overlooking (forgetting) that all is very good and that man and woman God made man, but blaspheming, would raise the creature, either to straighten, or to cure and to straighten out of the Church (to get tired). As well as the layman" [3].

The fish meat has a more special status, taking into account that, at certain major holidays, there is a reluctance to eat and such (see, for example, Canon 5 of Nichifor the Confessor). As a rule, these disclosures are mentioned in the church calendars, being more widely organized in the Great Typical or in the various pravs that have appeared over time [13].

Also, a problem that some raise is the status of the so-called "seafood", considering that, in the context of increasing globalization, they become accessible also in areas where they are not naturally found. However, this is a false problem, generated by the misleading name under which these foods are known, but also by a certain practice, in the Greek space, of eating these "seafood" in all, or almost all, days. by post. In fact, it is not about fruits, but about aquatic life, molluscs or crustaceans, which makes them have the same regime as fish or fish [4].

Fasting represents total or partial withholding of certain foods and beverages, for a longer or shorter time, for religious-moral purposes. This restraint from food and drink must, however, be accompanied by restraint from thoughts, cravings, passions, and evil deeds, which means that the bodily posture must be accompanied by a spiritual fasting. The fast is of divine origin and institution, which is why we find it practiced since ancient times, meeting it in almost all religions and all peoples. According to some Holy Fathers such as: Basil the Great, John the Golden Mouth and others, he has his origin in heaven, by forbidding God forbid our parents to eat from the stopped tree [8, 15].

Starting from the official position of the Romanian Orthodox Church (BOR), we consider that the optional quality scheme can verify compliance with the technical aspect of food production / processing, without being able to intervene on the spiritual component of the Christian-Orthodox Lent.

In the case of the post products, the referential will belong to the BOR and will be promoted and coordinated by it. The distinctive marks applied on the certified / certified products will belong to BOR and will be registered with OSIM as a trademark and industrial design.

Applicants for the voluntary food quality certification system of Post will introduce in the HACCP programs procedures aimed at controlling the composition of the products, so that, during all stages of the technological process, the product is not "contaminated" with raw materials / auxiliary materials. not allowed (sweet) in the diet of those who "fast" [11].

The certification benchmark will include the list of prohibited ingredients for use in fast food products, as well as the methods of analysis used to verify product conformity.

The specialized department within the MADR directly or by delegation to a specialized body, will verify that the product meets the requirements of the certification referential and in case of product conformity will issue the Post product certification. The certification reference and the list of approved inspection and certification bodies for the delegation of competence will be published on the MADR website.

An extremely important role in the functioning of the proposed quality scheme will be played by the veterinary sanitary laboratories. Laboratory services will be used both for self-inspections initiated by the producers and for the official controls exercised by the competent authorities [10].
The register of products certified by Post will be published and updated online on the MADR website at the specific section of the quality scheme.
As in the case of the certifications of the products obtained in the LSAA system, transparency in the communication of irregularities to the consumer will be maintained through the website [1, 16].

MATERIALS AND METHODS

For writing job descriptions, various writings of a religious nature were analyzed, starting from the origin of the post. Also, the number of quality schemes at the level of the European Union, as well as the number of believers were analyzed, thus representing the sales market for the job products.

RESULTS AND DISCUSSIONS

European manufacturers can continue to offer a diverse range of quality products only if they are adequately rewarded for their efforts. This implies that they have the ability to inform buyers and consumers about the characteristics of their own products, under conditions of fair competition. It also means that producers can correctly identify their products on the market. The quality and diversity of the agri-food production in the European Union is one of its strengths, in recent years it represents a competitive advantage for the Union producers and significantly contributes to its current cultural and gastronomic heritage. This is due to the competences and determination of the farmers and producers in the Union, who kept alive the traditions and, at the same time, took into account the new production methods and materials.
The study conducted by the Commission in 2010 [Arete - Inventory of certification schemes for agricultural products and foodstuffs marketed in the EU Member States] finds an important diversification of voluntary certification systems for agricultural and food products. The Commission's inventory for 2010 lists 441 different schemes (including sub-schemes), 424 EU and 17 non-EU ones (Fig. 1.).

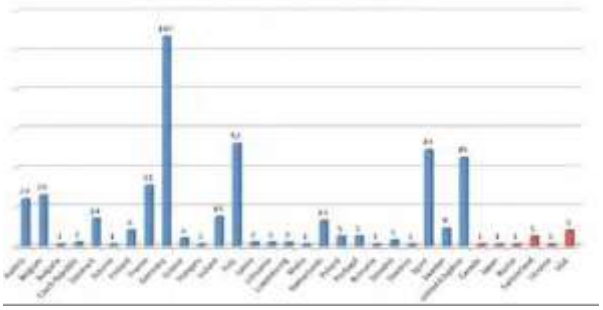

Fig. 1. Number of schemes, by country of origin (total number of schemes = 441 (including sub-schems), EU schemes = 424, non-EU schemes = 17)
Source: study Arete– Inventory of certification schemes for agricultural products and foodstuffs marketed in the EU Member States.

In this European socio-economic context, in which the certified quality represents an advantage of the farmer and a request of the consumer, Romania has not introduced in the national strategy of rural development the European measures regarding the Quality and Promotion of the agri-food products [1].
According to the data presented by The Pew Research Center in December 2011, there are approximately 2,184,060,000 Christians worldwide, representing 31.7% of the world's population. (In the second place are Muslims with 23% of the population of the world, followed by Hindus with 15%). Roman Catholics represent about 50% of the total number of Christians, being about 1,094,610,000. Most of them live in Brazil (over 133 million), Mexico (over 96 million) and the Philippines (nearly 76 million). Protestants of different denominations (including neo-Protestants) represent approximately 36.7% of the total number of Christians, ie about 800,640,000 people. More than a third of them live in the two Americas, and 12.6% in Europe.
Eastern Christians (orthodox and Monophysite, calculated together by this

institute) represent 11.9% of the total number of Christians, ie approx. 260,380,000 believers. Most monophysite Christians are in Ethiopia (about 36 million) and Egypt (about 3.5 million), and others in Armenia, Syria and Lebanon.

Table 3. Ranking of the countries with the most Orthodox Christians in 2018

No. Crt.	Country	Number	Weight from no. Totally Orthodox
1.	Russia	101,450,000	39%
2.	Ukraine	34,850,000	13.4%
3.	Romania	18,750,000	7.2 %
4.	Greece	10,030,000	3.9%
5.	Serbia	6,730,000	-
6.	Bulgaria	6,220,000	-
7.	Belarus	5,900,000	-
8.	Georgia	3,820,000	-
9.	Republic of Moldova	3,270,000	-

Source: Wikipedia.org

Most Orthodox Christians are found in Russia (over 100 million), followed by Ukraine (about 35 million) and Romania with about 19 million Orthodox (Table 3.).
According to the number of believers belonging to the Autocephalous Churches, almost 60% of all Orthodox in the world belong to the Russian Orthodox Church (Moscow Patriarchate). Next are the Romanian Orthodox Church (2nd place), Elada Orthodox Church (3rd place) and the others. Not all Orthodox in the world are part of one of the 15 Autocephalous Orthodox Churches, but there is an insignificant percentage of followers of some schismatic Orthodox groups. About 80% of all Orthodox people live in Europe.

Fig. 2. Symbols used for HALAL certified products
Source: Master course support control and experience of ecological food, halal and kosher, Prof. dr. Constantin Necula.

Over the course of two years, these data have changed little, especially in the majority Muslim countries, where the number of Christians is steadily decreasing [6].

Fig. 3. Symbols used for KOSHER certified products
Source: Master course support control and experience of ecological food, halal and kosher, Prof. dr. Constantin Necula.

Figure 3 shows a series of symbols for KOSHER certified products (Fig. 3.).

Photo 1. Label on the shelf with post products
Source: The most healthy fast food products, Elena Oceanu.

In Romania, fast food products are usually labeled according to the image above (Photo 1).

CONCLUSIONS

Starting from the presented statistical information, it can be concluded as a certification of the Post product, it will be addressed to a total population of over 260 million, and in Romania over 16 million consumers will be targeted. By setting the basis for a certification standard for Post products, Romania will be able to add

religious certification schemes HALAL and Kosher, the product of Post. The expected effects are both economic, as well as emotional - national, positioning the Romanian certified product in the attention of the European Christian-Orthodox consumer.

The certification of Orthodox Christian fast food products is extremely important, given that the specific products of other religions have already been made, and the fast food market is extremely attractive.

Romania can become the first country that standardizes in a quality certification scheme the religious reference. The biggest advantage of the certification standard is that it can be easily introduced in national and international normative acts on food safety, animal welfare, thus ending disputes between veterinary health authorities and representatives of religious cults (Muslim, Mosaic, Christian-Orthodox).) owners of certification standards.

The market for HALAL products in 2017 was $ 2.1 billion and the development potential according to Statista.com is forecast for 2023 at $ 3 billion.

The market for kosher products is estimated at $ 24 billion per year with growth potential of 11.5% by 2025. Statistics show that over 40 million people prefer these foods, with most consumers in the US, Israel and Australia.

Statistics shows that about 44% of the kosher production - food, drink, spices and others - is bought by Jews, 19% by Muslims, and the difference of 37% by those without religious affiliation, but who attach great importance to the style of food.

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CEREAL OFFER IN MEHEDINŢI COUNTY (2015-2017)

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Abstract

Mehedinţi County is part of the South-west Oltenia region, through its area (total, agricultural and arable – 493,289, 223,344 and 187,957 ha) representing the fifth component under the total surface and third for the agricultural area and the respective arable. The existence of a fairly vast palette of cereal crops is observed: wheat and rye, barley and two row barley, oats, corn grains, sorghum and "other cereals". Within the total area of 108,461.33 ha, maize grains, wheat and rye (weights of 50.63 and 40.37%) predominating, the rest of the crops holding weights below 5%. The county obtains a total production of 429,879.67 t, to which the largest contributions have been brought, maize grains (53.73%-higher than the surface), wheat and rye (39.61%-less weight than in the case of the surface), the rest of the crops having contributions below 4%. In relation to average production, a general level of 3,963 kg/ha is found, compared to which only maize is recorded in excess.

Key words**:** *area, average production, cereals, offer, total production*

INTRODUCTION

Mehedinţi County is located in the South-western part of Romania, between the historical regions of Banat and Oltenia [11].
Cereals (wheat, rye, barley, oats, maize, sorghum, etc.) are economically important under food, industrial, fodder, agro-technical, technological, as a source of profit and for export [7]. For example, under the Human nutrition report, cereals are the most important source of energy (from 30 to 80% of daily calorie consumption in developed and poor countries) [1].
At the global level, cereals are grown on significant surfaces. According to FAO data, cereals occupy more than half of the arable surface [4].
Cereals are the main vegetable species grown in Romania [3]. The main cereal in Romania is maize, followed by wheat [3].
Development of grain production, based on modern technologies, genetic material performance, irrigation expansion, use of fertilizers and modern methods of crop protection [8].
Currently, cereals (especially wheat, rice and maize) consume about 60% of the total quantity of chemical fertilizers, and by the year 2050, these crops are expected to consume a little over 50% of the consumption of fertilizers [5].
Cereals can be cultivated on an ecological diet. However, Europe is a region where the area cultivated with cereals decreases as a result of the low-scale practice of organic crops for this group of plants [2].
The work seeks to highlight the role of Mehedinţi County at regional and national level with regard to the establishment of the primary supply of cereal grains.

MATERIALS AND METHODS

The method of analysis used is the comparison, which is used in time and space [6]. A dynamic series has been built with 4 terms (years 2015, 2016, 2017 and average period).
The indicators used are, the cultivated area (ha), total production (t) and average production (kg/ha). For the first two

indicators, structures (by species) were determined and average production was positioned at species level, compared to the general county situation.
The completion of the analysis is based on the framing of Mehedinţi County, at national and regional level, so that its contribution was also pursued to the achievement of national and regional levels of indicators (%).

RESULTS AND DISCUSSIONS

Table 1, presents the structure of the county area cultivated with cereals, at general level and on crops [10].

Table 1. Area cultivated (2015-2017)

Specification	Year						Average**	
	2015		2016		2017			
	Eff. (ha)*	Str. (%)**	Eff. (ha) *	Str. (%)**	Eff. (ha) *	Str. (%)**	Eff. (ha)	Str. (%)
Total cereals	107,481	100.00	111,304	100.00	106,599	100.00	108,461.33	100.00
Wheat and Rye	42,329	39.38	44,210	39.72	44,836	42.06	43,791.67	40.37
Barley and Two row barley	4,224	3.93	4,896	4.40	5,017	4.71	4,712.33	4.34
Oats	3,676	3.42	3,649	3.28	3,710	3.47	3,678.33	3.39
Maize	56,113	52.21	57,203	51.39	51,411	48.23	54,909.00	50.63
Sorghum	6	0.01	33	0.03	178	0.17	72.33	0.07
Other cereals	1,133	1.05	1,313	1.18	1,447	1.36	1,297.67	1.20

*http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 20.12.2018)
**own calculation.

The year 2015, is characterized by a total area cultivated with cereals of 107,481 ha, of which the main species held weights of: 52.21% corn grains – 56,113 ha, 39.38% wheat and rye – 42,329 ha, 3.93% barley and two row barley – 4,224 ha, 3.42% oats – 3,676 ha 1.05% "other cereals" – 1,133 ha, and 0.01% sorghum – 6 ha.
If we analyze the situation of 2016, we find variable surfaces of cereals, as follows: 33 ha sorghum, 1,313 ha - "other cereals", 3,649 ha oats, 4,896 ha - barley and two row barley, 44,210 ha wheat and rye, 57,203 ha grain corn. These areas led to a total of 111,304 ha cultivated with cereals, of which the following weights were recorded: 0.03% sorghum, 1.18% "other cereals", 3.28% oats, 4.40% barley and two row barley, 39.72% wheat and rye, 51.39% corn.
For 2017, at the county level the total area cultivated with cereals was 106,599 ha, of which the main species occupied: 48.23% corn – 51,411 ha, 42.06% wheat and rye – 44,836 ha, 4.71% barley and two row barley - 5,017 ha, 3.47% oats - 3,710 ha, 1.36% "other cereals" - 1,447 ha and 0.17% sorghum - 178 ha.
The average of the analyzed period, shows at county level, a total area cultivated with cereals of 108,461.33 ha, of which the main cereal species achieved: 0.07% sorghum (72.33 ha); 1.20% "other cereals" (1,297.67 ha); 3.39% oats (3,678.33 ha); 4.34% barley and two row barley (4,712.33 ha); 58.14% wheat and rye (43,791.67 ha); 50.63% grain maize (54,909.0 ha).
Reported at national level, Mehedinți County held: 2.17% of the area allocated to the maize corn crop, 2.16% to the oats, 2.08% to wheat and rye, 2.02% to the general level, 1.0% to the barley and two row barley crop area, 0.59 % of the sorghum surface (fig. 1.). Analyzing the situation of Mehedinti County, in the context of the South-West Oltenia Development Region, it is observed that it had variable weights (in the main species) from 2.54% in the case of sorghum, up to 20.27% in the case of oat. (Fig. 1.).

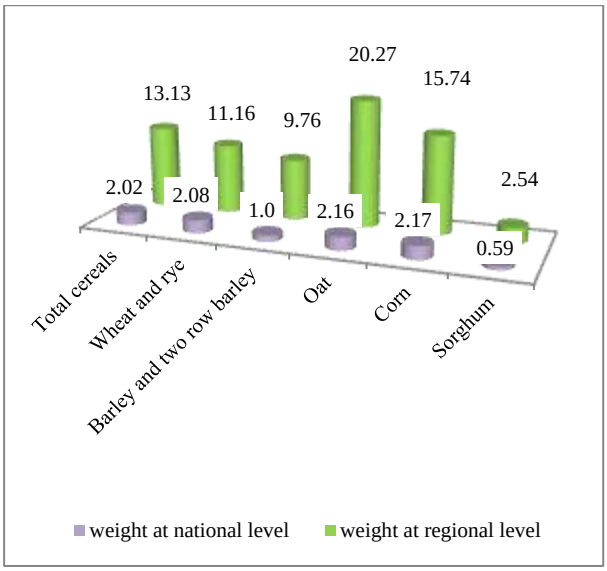

Fig. 1. The cultivated surface. Mehedinti county share at national and regional level - average of the period (%)
Source: http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 20.12.2018)

The structure of the county cereal production, on a general level and on crops are shown in Table 2.

In 2015, from the county total of 309,590 t, it is observed that the main crop was maize with 157,557 t - 50.89% of the total, followed by wheat and rye with 129,866 t - 41.95%, barley and two row barley with 12,580 t - 4.06 %, oats with 5,833 t - 1.88%, "other cereals" with 3,748 t - 1.21% and by sorghum with a total production of 6 t - 0.01% of the total.

The year 2016, is noted by a county level of total cereal production of 391,524 t, of which, the component crops held weights, as follows: 51.41% maize corn - 201,282 t, 41.30% wheat and rye - 161,715 t, 4.08 % barley and two row barley - 15,960 t, 2.02% oats - 7,916 t, 1.17% "other cereals" - 4,566 t and 0.02% so rghum - 85 t.

Table 2. Total production (2015-2017)

Specification	Year						Average**	
	2015		2016		2017			
	Eff. (t)*	Str. (%)**	Eff. (t) *	Str. (%)**	Eff. (t) *	Str. (%)**	Eff. (t)	Str. (%)
Total cereals	309,590	100.00	391,524	100.00	588,525	100.00	429,879.67	100.00
Wheat and Rye	129,866	41.95	161,715	41.30	219,285	37.26	170,288.67	39.61
Barley and Two row barley	12,580	4.06	15,960	4.08	20,298	3.45	16,279.33	3.79
Oats	5,833	1.88	7,916	2.02	8,792	1.49	7,513.67	1.75
Maize	157,557	50.89	201,282	51.41	334,067	56.76	230,968.67	53.73
Sorghum	6	0.01	85	0.02	99	0.02	63.33	0.01
Other cereals	3,748	1.21	4,566	1.17	5,984	1.02	4,766.00	1.11

*http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 20.12.2018)
**own calculation.

If we analyze the situation of 2017, we notice that the total cereal production - 588,525 t - was constituted by variable sequential contributions. Thus - in ascending order - the crops contributed: 99 tons of sorghum - 0.02% of the total, 5,984 t "other cereals" - 1.02%, 8,792 t oats - 1.49%, 20,298 t barley and two row barley - 3.45%, 219,285 t wheat and rye - 37.26% and 334,067 t of maize - 56.76%.

Based on the data presented above, the average of the period was determined, which is characterized by a total county level of 429,879.67 t, whose structure was the following: 53.73% maize - 230,968.67 t; 39.61% wheat and rye - 170,288.67 t; 3.79% barley and two row barley - 16,279.33 t; 1.75% oats - 7,513.67 t; 1.11% "other cereals" - 4,766.0 t; 0.01% sorghum - 63.33 t.

Analyzing the situation of the county Mehedinți, at national level, it is observed that it had variable weights (in the main species) from 0.17% in the case of sorghum, to 1.98% in the case of oats (Fig. 2.) - weights lower than those held of the cultivated area. Reported, in the situation specific to the South-West Oltenia Development Region, Mehedinți County obtained: 21.94% for oats,

15.80% from the production related to the maize crop, 13.28% at the general level, and 11.42% from the wheat and rye production, 8.87% from barley and two row barley production and 1.09% from sorghum production (Fig. 2.).

Table 3 contains information regarding the level of average production per productive unit (kg/ha).

In 2015, the county obtained a total average production of 2,880 kg / ha, against which - at the level of the component crops of the group - the situation was the following: 3,068 kg / ha in wheat and rye (106.53% compared to the comparison term - general level of the indicator), 2,978 kg / ha for barley and two row barley (103.40%), 1,587 kg / ha for oats (55.10%), 2,808 kg / ha for maize (97.50%), 1,000 kg / ha for sorghum (34.72%) and 3,308 kg / ha for "other cereals" (114.86%).

The year 2016, registered an average county production of 3,518 kg / ha, against which we find positions of cereal crops as follows: 61.65% oats - 2,169 kg / ha, 73.22% sorghum - 2,576 kg / ha, 92.67% barley and two row barley - 3,260 kg / ha, 98.86% "other cereals" - 3,478 kg / ha, 100.03% corn - 3,519 kg / ha and 103.98% wheat and rye - 3,658 kg / ha.

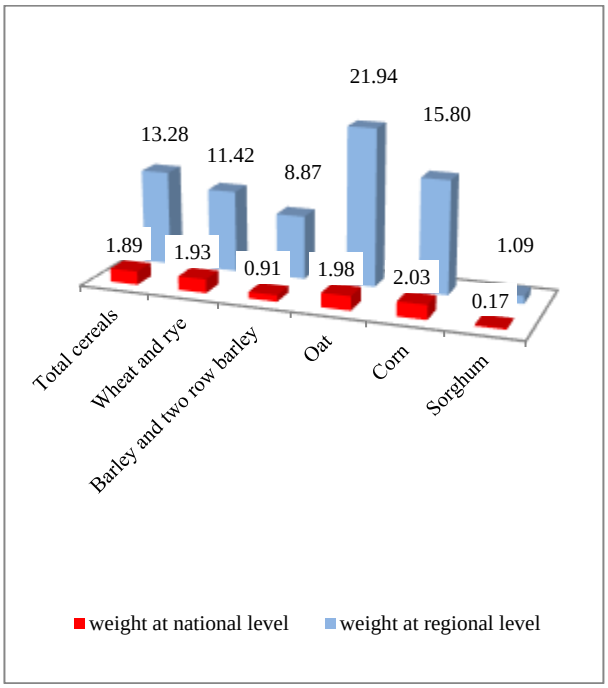

Fig. 2. Total production. Mehedinti county share at national and regional level - average of the period (%)
Source: http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 20.12.2018)

Table 3. Average yield (2015-2017)

Specification	Year						Average**	
	2015		2016		2017			
	Eff. (kg/ha)*	% compared to the total **	Eff. (kg/ha)*	% compared to the total **	Eff. (kg/ha)*	% compared to the total **	Eff. (kg/ha)	% compared to the total
Total cereals	2,880	100.00	3,518	100.00	5,521	100.00	3,963	100.00
Wheat and Rye	3,068	106.53	3,658	103.98	4,891	88.59	3,889	98.13
Barley and Two row barley	2,978	103.40	3,260	92.67	4,046	73.28	3,455	87.18
Oats	1,587	55.10	2,169	61.65	2,370	42.93	2,043	51.55
Maize	2,808	97.50	3,519	100.03	6,498	117.70	4,206	106.13
Sorghum	1,000	34.72	2,576	73.22	556	10.08	876	22.10
Other cereals	3,308	114.86	3,478	98.86	4,135	74.90	3,673	92.68

*http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 20.12.2018)
**own calculation.

For the year 2017, at the county level, average variable yields were obtained from 556 kg / ha in the case of sorghum (-89.92% compared to the general county level) up to 6,498 kg / ha in the case of maize (+ 17.70%). The rest of the crops were below the general level of the indicator (5,521 kg / ha), as follows: -57.07, -26.72, -25.10 and -11.41% oats, barley and two row barley, "other cereals", respectively wheat and rye (2,370, 4,046, 4,135 and 4,891 kg / ha).

At county level, the average of the period shows an average production of 3,963 kg / ha, against which, the positioning of the crops was the following: -77.90% sorghum - 876 kg / ha; -48.45% oats - 2,043 kg / ha; -12.89% barley and two row barley - 3,455 kg / ha; -7.32% "other cereals" - 3,673 kg / ha; -1.87% wheat and rye - 3,889 kg / ha; + 6.13% maize - 4,206 kg / ha.
Reported at national level, Mehedinți County has realized average productions, on the productive unit, strictly subunit, from 29.53 to 93.42% for sorghum and total cereals respectively (Fig. 3).

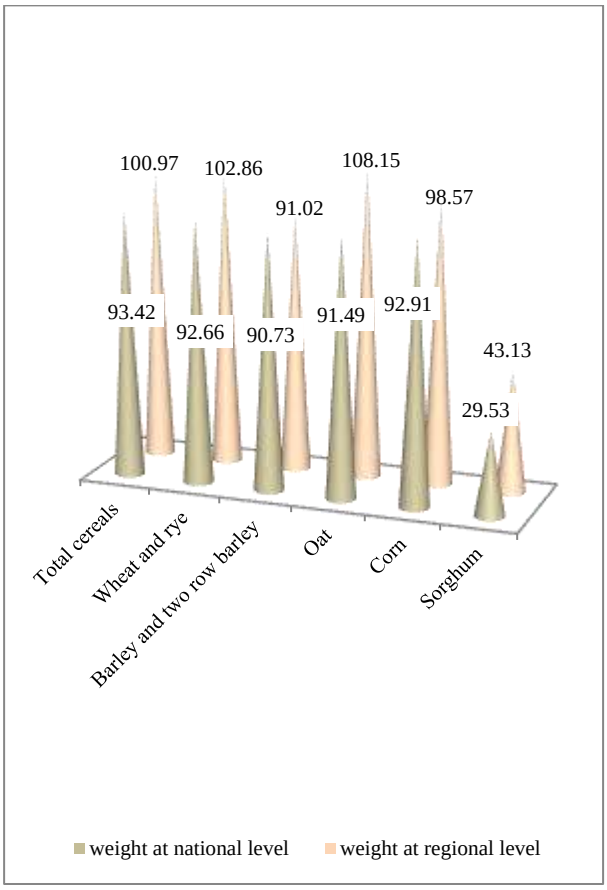

Fig. 3. Average production. Mehedinti county positioning at national and regional level - average of the period (%)
Source: http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table (Accessed on 20.12.2018)

Analyzing the situation of Mehedinti county, in the context of the South-West Oltenia Development Region, it is observed that it has exceeded the reporting term for total cereals (100.97%), wheat and rye (102.86%) and oats (108.15%), and to the rest of the crops, the actual level of the average county production is below the reference term (from 43.13 to 98.57% for sorghum and maize - Fig. 3).

CONCLUSIONS

If we refer to the cultivated area, within the total area of 108,461.33 ha, maize, wheat and rye predominate (weights of 50.63 and 40.37% respectively), the rest of the crops having weights below 5%. The indicator evolved unevenly over time for the entire cultivated area, an aspect that also manifests itself for oats and maize, respectively, with the exception of the rest of the crops that recorded increases of the indicator. In general, except for sorghum, the variations are not very pronounced.
Regarding the total production, the following aspects are worth mentioning: the county obtains a total production of 429,879.67 t, to which the most contributions were made from maize (53.73% - weight higher than the surface), wheat and rye (39.61% - less weight than in the case of the surface), the rest of the crops having contributions of less than 4%; the evolution of the indicator was an ascending one for all the cultures as well as at the general level of the sector. The most pronounced increases occur at sorghum. For years, the year 2017 is noted with the most important increases.
For the average production, the following aspects are to be highlighted: the general level of 3,963 kg / ha of the indicator, against which there are registered surpluses only in maize; at general level the indicator has evolved upwards, except for the sorghum where the evolution was a fluctuating one.
Mehedinți County, does not constitute an important supplier of cereals at national and regional level, but this situation can be improved (within the limits of the existing possibilities, taking into account the existing relief) by increasing the performances of technical and technological nature.

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THE USE OF BLOCKCHAIN TECHNOLOGY AND CRYPTOCURRENCIES AS EXCHANGE RATE IN THE GREEK AGRICULTURAL AREA

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Abstract

The purpose of this paper is to investigate the role of the new blockchain technology by making use of the derivatives of this technology such as bitcoin to interpret their application to the wider agricultural sector and to study designing a case-by-case project in the Greek agricultural sector. The methodological approach is based on the research of scientific approaches as well as on scientific bibliography and research of special purpose software. As a result of this research, it can be said that this technology, although still at an early stage, seems to have positive effects without protests and its derivatives (e.g. cryptocurrencies) can benefit rural space, both in both international and Greek.

Key words**:** *agricultural economy, cryptocurrencies, blockchain technology, agriculture development*

INTRODUCTION

Today, Greece fights as country but also as a member of Europe to retreat after a long-time financial crisis that has struggle.

Over the past few years, the euro as a currency had fluctuations in exchange rates against other currencies.

Looking at the past, however, we find that Greece did not always have the euro as its currency, which Phoenix was the first monetary unit used by the state of modern Greece. It was first presented in 1828 with 1 unit divided into 100 sub units, and was the basic monetary unit of the then Greek state. [1]

The currency is the purchasing power of the people. Purchasing power or market value of money is defined as the inverse of the general price index. That is, Purchasing Power (X) = 1 / P, where P is the price index. It expresses the quantity of products one can obtain with a monetary unit today, in relation to the quantity he could obtain at some earlier base year. [9]

On the other hand, not all countries have the same currency, so someone who wants to trade raw materials from abroad how can he succeed?

For this reason, an exchange market has been created from which the exchange rates of currencies are exported so that the traders can complete the transactions between them.

By the term foreign exchange market we mean mainly the closed inter-banking cycle of the largest commercial banks and investment banks and all over-the-counter money transactions, i.e. deposits in different currencies (foreign exchange) as well as highly liquid financing products such as short-term derivatives in currency , among these banks (it is estimated that about 50% of the total volume of transactions is among the major very large banks), but also all other transactions between smaller "players" (smaller banks, institutional investors). [6]

But what happens when there is a lack of decentralized administration, such as the absence of banks as regulators in the financial system, and what kind of impact does this have on the foreign exchange market?

The answer to this question is given by the technology called Blockchain. According to Mr. Antonio Grasso, Founder and CEO of Digital Business Innovation, Blockchain is the technology of the future.

"In 2019, technology will move beyond initial investments in cryptocurrencies and will begin to deliver real business value in the form of smart contracts.
In the next 12 months, smart contracts will eliminate the need for intermediaries (and the costs involved), and allow day to day transactions to run smoothly. They add a level of business logic, allowing organizations to make effective use of the blockchain in productive ways that improve workflows and processes.
This may mean introducing technology into order processes, pricing, or payment processes - and generally in all transactions involving individuals and data.
As the regulations and security that support these smart contracts become stronger in 2019, their adoption will increase.
In turn, this phenomenon will allow businesses to become more decentralized autonomous organizations (DAO), a model that aims to create full transparency.
A DAO is essentially an organization whose operating procedures and protocols are automatically implemented by encoding them in the form of a computer program."[2]

MATERIALS AND METHODS

The material used for this research is the sources of knowledge of the international financial system and the functioning of finances in combination with the information systems and the structure of the Greek rural area.
The methodological approach followed is based on the research of scientific approaches as well as on scientific bibliography and research of special purpose software.

RESULTS AND DISCUSSIONS

Blockchain technology arises from a network of people who create and share something in common. The main feature of this network used in chain technology and computer language belongs to the network category under the Peer-to-Peer network.
The network is decentralized and distributed equally. This means that there is no person in the network who is superior to someone else in any way, so there is no priority (of any kind) of one person over someone else.
Blockchain Technology

Fig. 1. Blockchain Technology Symbol
Source: [5].

The faces of the participants in the network are not the same, but they are equal with each other in relation to any process of election and / or choice between them. Statistically speaking, if a subject is elected, this election will give equal success rates to each of these persons and this will be done at random.
All faces of the blockchain network create and share a file together. The process of creating and preserving this file is determined and controlled by a Constitution of Rules, called the Consensus Protocol. These rules are based on the essential need for the existence of trust between these persons. What this phrase means refers to the need for proof of trust between network members only in exceptional cases, if not at all possible.
The compilation of a compact consensus protocol removes the creation of conditions that lead to the need to demonstrate to network members their honesty with regard to their participation in the network, and thus the right to coexist there. [4]
The most famous application of Blockchain is Cryptocurrencies.
Cryptocurrencies
Hidden Currency is a peer-to-peer decentralized electronic form of money based on the principles of cryptography to secure the network and verify transactions. Most encryption uses a Distributed Database as the pillar of their system, the so-called Blockchain. The bitcoin presented in 2009 became the first successful decentralized currency. Due to the open nature of his

software, many developers have been allowed to experiment with his code and modify it. Since then, a multitude of new encryption has been created in which efforts have been made to improve or add functions such as faster transactions, greater anonymity, and so on. [7]

Export Cryptocurrencies

But let's just give a few words about acquiring these cryptocurrencies and let's take as an example the bitcoin that is the most widespread (the process is the same for all encryption).

Bitcoin, because it is decentralized, needs the contribution of random computers from across the globe to confirm the transactions that are made globally. This process requires a huge amount of computational power. New bitcoins are issued every ten minutes, which are given as a reward to those who contribute to the confirmation of transactions, according to the contribution of each. Those who confirm transactions to receive some reward are called miners and the mining process, respectively.

Each transaction made with Bitcoin passes a validation check and then is placed in a block along with other completed transactions.

Each block that is created has a direct relationship with the previous one and with all the other blocks. This creates a block chain.

The relationship of each new block with the predecessor is determined by a mathematical algorithm, but it is difficult to create.

Each time a new block is created, a number of new Bitcoins are automatically generated, which are shared by those who have solved the algorithm according to each contributor, this process is called Mining. [5]

And in this way the cryptocurrencies are obtained.

Bitcoin

Fig. 2. Bitcoin Symbol
Source: [3].

The first historical application of the blockchain technology was the Bitcoin digital coin, by Satoshi Nakamoto. In this paper a solution was proposed to a famous problem of Mathematics by applying this solution in the financial sector. It was possible for a community of people to build a network of computers and through this network to carry out financial transactions between themselves with mathematically proven security of their property and at the same time there is no central power that can intervene in any way they would like, which govern whether or not all of these transactions are carried out. [8]

Bitcoin is therefore the most famous of all these cryptocurrencies as well as the first one. It is the virtual currency that over the last few years has reversed the data in the trade and despite the predictions of the opposite is constantly being strengthened. [3]

At the same time, however, Bitcoin displays a broad list of other currencies that also rely on blockchain technology. But none of them have succeeded in achieving Bitcoin's parity.

Currency Rates

Bitcoin like any other currency (conventional or virtual) is a stock market, that is, its value is based on supply and demand and hence its exchange rate is formed.

Current Exchange Rates

US Dollars Exchange Rate

Fig. 3. The course of exchange of bitcoin in Dollars.
Source: [3].

The exchange rate of the dollar bitcoin is a basic parity as most exchanges choose the dollar as the basic currency.

The Exchange Rate is 1BTC = 3.963,35 $ USD

Euro Exchange Rate

Fig. 4. The course of exchange of bitcoin in Euros. Source: [3].

The exchange rate with the euro as the main contractual currency of the European Union is another important paradigm with which the stakeholders should be familiar.

The Exchange Rate is 1BTC = 3.497,66 € Euro

Historical Flashback in Exchange Rates

The exchange rates have not always been kept at the same level, and this is derived from the graph below, from which we see the changes per year in the Bitcoin value.
At 2017 was a landmark year for bitcoin as its exchange rate hit 1 bitcoin = $ 20,000

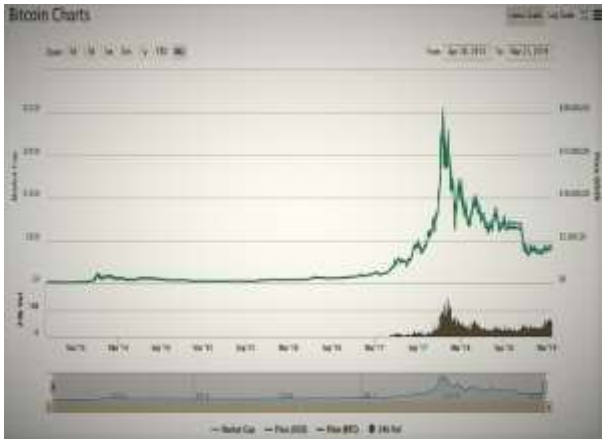

Fig.5. The course of exchange of bitcoin. Source: [3].

Applications in rural areas

The above finds applications in rural areas in both the financial part, which will be listed below in a project, as well as the ability to automate processes through Blockchain technology.

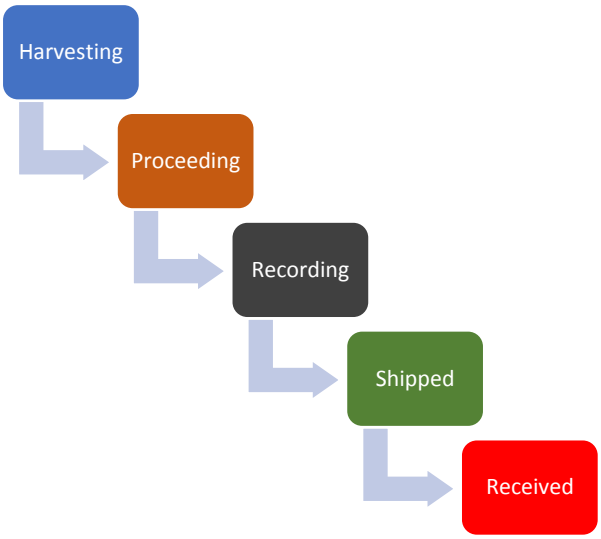

Fig.6. Blockchain Process in Agriculture Sector
Source: Created by researcher.

Other advantages arising from the use of the above-mentioned technology and its derivatives are:
i. The speed of international transactions
ii. Low transaction costs
iii. User control
iv. Portability and backups
v. Transparency of transactions
vi. The existence of subdivisions of digital coins
vii. The irreversible nature
On the other hand, it is worth mentioning the negative ones that are:
a) The risk of password loss
b) Unclear legal framework
c) Network security
d) The dangers of young people
Consequently, on the basis of the above, this technology is applied in the rural area through food safety and hygiene, quality preservation, and environmental protection.
The main advantage is the ability to safely manage traceability data in a chain that reaches the consumer as a consumer, that is, the consumer is able to use a barcode already on the packaging, with his cell phone to see from which producer the agricultural product was produced, when it was harvested.
Equally important is that through this chain, the food safety inspector of the Greek State Service can have credible data to keep the chain up to the consumer, ie it has the

potential for a frozen food, for example, to keep cool the chain of refrigeration broke throughout the transport or at some point, which meant that the temperature of the food increased, which made it dangerous for the consumer.

Blockchain technology, also because of its chainlike character, makes it possible to make the control of organic products more reliable. As mentioned above, the Greek State Food Safety Authority can check whether the products are organic or there are residues in the soil from pesticides. This can be accomplished through dedicated sensors, where they will send information to a computer, which in turn will transmit the information to the central server of the Ministry of Rural Development.

This process can also be followed for environmental protection, as well as the levels of groundwater contamination caused by pesticide residues.

Blockchain technology and its derivatives therefore find a clear application in rural areas.

Project: Creating Cryptocurrencies Mining Unit

Based on the above, a Project that could be implemented is the creation of an extraction unit of cryptocurrencies with the main purpose of financial independence of a rural unit through the reduction of its expenses.

That is, the farmer will export cryptocurrencies that will exchange with money at parity and will pay expenses, raw materials or fuels, etc.

This is possible with the following excerpt:

1) Mining Ring as a mining machine = 5.000 €

2) Pc Built = 1,000 €

3) Autonomous Photovoltaic System 26 KW / h per day = 15,000 €

Total 21.000 €

As far as the number 3 is concerned, we are avoiding electricity charges where, in the case of Greece, this is 0.08500 € = 1 kW / h, so we would have a current charge of 122,40 € per month. From such a system a farmer may have an additional income of 350 € per month.

If the acres are more and decides to multiply the investment with larger photovoltaics as well as with more robust computing systems, then when the cost of the initial investment is clearly increasing, the monthly income of the producer, who will not have to spend time and will have additional income that can be used to buy raw materials but also automate processes in cultivation.

CONCLUSIONS

In conclusion, we can say that cryptocurrencies have many advantages, which are more than the disadvantages they present. In short, it is a technology at its beginnings, and it is surely now slowly revealed, but based on the evidence we need to give it time and space to reveal things that will make people's lives easier and will serve both the academic and scientific space.

It is also worth mentioning that Greece has the ESPA program, which is a state-owned tool for financing enterprises with EU funds, which are offered for business development purposes. From this program, there is the possibility for farmers to raise capital to develop their production through precision agriculture. Unfortunately, it is a frequent phenomenon in Greece, money goes for this purpose and farmers buy luxury cars, so through Blockchain technology the state can be sure that the money goes for their real purpose, but this is left as a resource for scientists of the future to study ways to develop such a function.

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TOURISTS' SATISFACTION DEGREE FOR SERVICE QUALITY IN HOTEL INDUSTRY. A CASE STUDY IN ROMANIA

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Abstract

The paper aimed to estimate customer's satisfaction degree determined by the quality of the hotel services. In this purpose, a face to face survey based on questionnaires was run in September 2019 using a sample of 34 Romanian and foreign tourists who had one night accommodation, dinner and breakfast in Krystal Hotel, a three stars unit in Hunedoara County. The results of their answers were processed using a 5-level Likert Scale which was helpful to calculate the scores for every item taken into consideration for characterizing the service quality in this hotel. The partial scores for various quality aspects were very high and as a result the global score accounted for 4.98, that is almost 5, which is the maximum figure a hotel could get. This study showed that the hotel managers who pay attention to service quality could be successful in their business for a long run. Customer's satisfaction degree must be carefully studied and be consider a fundamental item in setting up the future development strategy. A high service quality well correlated with price will be a guarantee for a high degree of satisfaction among customers, and in its turn, a high degree of satisfaction of the customers will assure a high tourist inflow, a higher occupancy rate, income flow and profit in hotel industry.

Key words**:** *tourists' satisfaction, service quality, hotel industry, Romania*

INTRODUCTION

The high growth rate of global tourism has stimulated the competition and, in this context, the quality of tourism services becomes a more and more important factor in getting the competitive advantage and better satisfying customers' needs and expectations (Ţîţu *et al*, 2016) [19].

A high quality service in travel and tourism industry strengthens and hels other branches of the economy to develop and increase GDP (Al-Abahneh, M., 2013, Toader and Mocuta, 2018) [1, 18].

There is no doubt that the offer of tourist services and tourist demand has to be well correlated. Accommodation is considered a fundamental of offer in tourism, as tourists needs a place where to rest. Hotel industry is on the highest position regarding high quality services which could satisfy the most exigent customers (Popescu Agatha, 2019a) [15].

In Travel & Tourism Competitiveness Index, there are included, among other criteria, Human resources, Health and Hygiene, Safety and Security, Price competitiveness, which are components reflecting service quality in tourism industry (Popescu Agatha, 2019b) [16].

The key indicator with a deep impact on the development of business in hotel industry is customer satisfaction. This term is usually used in marketing where it is symbolized as "CSat" and is utilized as a fundamental in setting up the future strategy. Also, customer satisfaction is a leading indicator of consumer purchase intentions and loyality" as affirmed Farris *et al* (2010) and Gutierez and Uribe (2011) [7, 8].

For this reason, hotel managers are interested to know the opinion of their clients about the quality of the delivered services. Only in this way, they could succeed to provide high quality services which have to meet tourists' expectations, determined by their education, income, needs and desires (Hokanson, 1995, Curaković *et al*, 2013, Tileaga and Oprisan, 2018) [4, 9, 17].

High quality service in a hotel is the guarantee that tourists will return and recommend it to their friends and relatives (Bowen and Chen, 2001, Keshavarz and Ali, 2015, Dominici and Rosa, 2010) [2, 6, 10].

The most used method to collect information about customers' satisfaction determined by the quality of services in a hotel is the face to face survey based on questionnaires (Pazir, 2019) [14]. Among the most used methods for processing data there are SERVQUAL, GAP, and also Likert scale.

Since 1985, when Parasuramam, Zeithaml and Berry started to measure quality service sector using SERVQUAL, this multi-dimensional research instrument has been improved in various alternatives depending on the context of its usage (Oliver, 1991, Daneshvar and Ramesh, 2010) [5, 12, 13].

In Oliver's opinion, the satisfaction degree reflects the difference between the expectations and realities, meaning perceived value regarding service quality in a hotel (Oliver, 1991) [12].

Consumers' satisfaction depends on a large range of factors whose importance has differed from an author to another. The most important ones are three factors: staff quality, room quality and price level as mentioned Choi and Chu, 2001 [3]. Also, Curakovic *et al.* (2013) synthesized the main determinants of consumer satisfaction as follows: staff quality (helpfulness, kindness, education, professionalism, friendly attitude), service speed (clear calculus of payment, precise billing and timeliness) and price (competitiveness and correlated with the perceived good value) [4].

In this context, the objective of this study was to present a case study on service quality in Romania's tourism, based on the evaluation of the satisfaction degree of the tourists who were accommodated in a three stars hotel in Hunedoara Municipality in September 2019.

MATERIALS AND METHODS

Brief description of the hotel.

The hotel is located in one of the most beautiful region of Romania named Transilvania, well known for its medieval castles and fortresses. The hotel is situated at the margin of the City of Hunedoara, in a quiet area, at 4/8 km from the city center and at a short distance from the main tourist attractions: 6.1 km from Corvinus Castle (meaning 10 minutes distance by care or coach) and 10.2 km distance from Deva fortress. From its location, tourists are not so far away from the ruins of the Old Ulpia Traian Sarmisegetusa fortress, the cradle of the Dacian civilization, from Prislop Monastery in Silvasu de Sus Village, where it is the tomb of the Father Arsenie Boca, a renowned theologian and monk, and from the National Natural Reservation in The Retezat Mountains. The hotel facilities are of a high diversity including: 17 spacious and elegant rooms of the following types: standard double room, twin room, superior twin room with balcony and superior double room with balcony.

Photo 1. Krystal Hotel. External view.
Source:
https://www.booking.com/hotel/ro/krystal.ro.html,
Accessed on April 30, 2019 [11].

Photo 2. Hotel room.
Source:
https://www.booking.com/hotel/ro/krystal.ro.html,
Accessed on April 30, 2019 [11].

The room are well equipped with air conditioned, heating, TV with many channels, minibar, relaxing area, furniture, balcony, bathroom (bath, sink, toilet, mirror, small towels, hair dryer etc). The hotel has also a free parking and free wifi, a terrace and garden, a restaurant and bar, a swimming pool in plain air endowed with umbrellas and long chairs, bath towels. Among other amenities there are: a nonstop reception service, a daily room service, laundry service, a luggage room, shoes cleaning, a vault, newspapers, fax and printing services, electronic payment system (bank transfer, Visa and Master card), but also payment in cash. The staff speaks English and Romanian.

Photo 3. Hotel restaurant, terrace and swimming pool.
Source:
https://www.booking.com/hotel/ro/krystal.ro.html,
Accessed on April 30, 2019 [11].

Data collection

Study sample. The study used a sample of 34 tourists who were in a two day excursion aiming to visit The Corvinus Castle, Prislop Monastery and then to have accommodation at Krystal Hotel during the night September 14/15, 2019, and in the next morning to travel to Alba Iulia to visit the Alba Carolina Medieval Fortress.

The 34 tourists were mainly from Romania, but also from Australia, Ireland and USA, but their common feature is that all of them are of Romanian origin.

These tourists were especially chosen because they experienced many travels through Romania and also through many other countries on various continents and were considered to be able to assess in the most critical manner the criteria used to characterize service quality in a hotel.

Photo 4. The interviewed tourists.
Source: Original. Sept.14th, 2019.

Questionnaire. The tourists had to answer a list of 12 questions carefully selected based on a "face to face survey". The questions approached the following aspects:

(i)Hotel location, view, road accessibility and distance from tourist attractions.

(ii)The reason why these tourists applied for accommodation and dinner in this hotel.

(iii)Quality of check-in and reservation service.

(iv)Quality of room service and comfort

(v)Bathroom service and comfort

(vi)Quality of restaurant and bar services

(vii)Safety and security

(viii)Breakfast room and food diversity and quality

(ix)Staff professionalism and quality

(x)Price per room and night in relationship with the service quality

(xi)Tourists' willingness to return to this hotel

(xii)Tourists' willingness to recommend this hotel to their friends and other potential customers.

Data processing methods

The paper is structured into two parts.

In the 1st part, there were presented the socio-demographic features of the interviewees.

The main demographic features of the respondents taken into consideration in this research have been: gender, age, marital status, country of origin, education level, profession, occupational status and monthly income.

The frequencies and also the percentages for all these demographic characteristics have

been calculated.
The statistical average and Standard deviation were determined for age and monthly income, using the well known formulas:

$\bar{X}=\frac{\sum_{i=1}^{n} x_i}{n}$ and $\delta^2\sqrt{\sum_{i=1}^{n}\frac{(x_i-\overline{X})^2}{n-1}}$

where:
x_i= the quantitative characteristic (age or income);
n=the number of respondents.
The 2nd part refers to the results obtained after processing the data and reflecting tourists' satisfaction for accommodation, and serving dinner and breakfast.
The answers of the interviewees have been processed, using a 5-levels Likert Scale, in order to estimate the scores for each criterion of service quality as well as the overall score. The meaning of the scale has been the following one: 5-Highly satisfied, 4-Satisfied, 3-Neither satisfied or dissatisfied, 2-Disatisfied and 1- Highly dissatisfied.
The results were presented in tables and finally correspondingly interpreted.

RESULTS AND DISCUSSIONS

The socio-demographic characteristics profile of the interviewed tourists

Table 1. The socio-demographic characteristics of the interviewed tourists

	Frequency	Percentage	Mean	St. Dev.
Gender				
Female	18	52.95		
Male	16	47.05		
Age				
Less than 65	3	8.82	68.44	8.58
66 – 70	19	55.96		
71 – 75	9	26.40		
76 and over	3	8.82		
Marital status				
Married	27	79.41		
Unmarried	3	8.82		
Widowed	4	11.77		
Country of origin				
Australia	2	5.88		
Ireland	2	5.88		
Romania	29	85.30		
USA	1	2.94		
Education level				
Higher Education, of which: Ph.D.	34 4	100 11.77		
Profession				
Engineer	25	73.53		
Doctor	2	5.88		
Professor	4	11.77		
Economist	2	5.88		
Veterinarian Doctor	1	2.94		
Occupational status				
Employed	8	23.52		
Pensioner	22	64.72		
Business man	4	11.76		
Monthly income level (Euro/month)				
Less than 1,000	19	55.90		
1,001-2,000	5	14.70	1,563.14	1,141.33
2001-3,000	5	14.70		
3,001-4,000	2	5.88		
Over 4,001	3	8.82		

Source: Own processed results based on the interviewees' answers, Survey, 2019.

Gender. The group of respondents was relatively balanced from gender point of view: 52.95 % being women and 47.05 % men (Table 1).

Age. The tourist group was relatively homogenous from age point of view because most of the respondents, more exactly 91.12 % were over 65 years and only 8.82 % younger. The average age in the group is a guarantee that the answers have a high credibility rate, taking into account that these tourists traveled not only in Romania, but also in many other countries from Europe and other continents (Table 1).

Marital status. Most of the interviewed tourists, more exactly 79.41 %, were married, 11.77 % widow and only 8.82 % unmarried (Table 1).

Country of origin. About 85 % of the interviewees were from Romania and 15 % from Australia, USA and Ireland (Table 1).

Taking into account that all these tourists were born in Romania, their structure by county of origin was the following one; 29.44 % from Bucharest, the capital of Romania, and all the others live in 12 counties from the South Eastern Romania (Arges, Calarasi, Constanta, Damabovita, Dolj, Gorj, Prahova, Teleorman, Vrancea) and just a few in counties from Moldova (Bacau and Suceava0 and a couple was from Brasov county situated in the South of Transilvania (Table 2).

Table 2.Distribution of the respondents by county of origin

Total	AG	BC	Bucha.	BV	CL	CT	DB	DJ	GJ	PH	SV	TR	VN
34	2	2	10	2	1	3	5	2	3	1	1	1	1
100%	5.88	5.88	29.44	5.88	2.94	8.82	14.70	5.88	8.82	2.94	2.94	2.94	2.94

Source: Own calculations.

Education level. All the interviewed persons graduated a faculty, therefore they have a high education level and even 4 of them (11.76 %) are Doctors in Science (Table 1).

Professional structure includes mainly*:* engineers who account for 73.53 %, university professors 11.77 %, doctors 5.88 %, economists 5.88 % and a veterinarian doctor 2.94 % (Table 1).

Occupational status. Despite that 85 % of the tourist group are over 65 years, therefore, they are pensioners, 23.52 % are still active being employed either in public institutions and private companies, 11.76 5 are business men and only 64.72 % are really retired, but still working in agriculture or in the garden or taking care of their grandchildren, being involved in various actions like volunteers (Table 1).

Monthly income varies from a person to another. About 55.90 % of the questioned persons earn less than Euro 1,000 per month, 14.70 % between Euro 1,001-2,000, 14.70 % between Euro 2,001-3,000, 5.88% between Euro 3,001-4,000 and 8.82 % earn over Euro 4,000 a month. The average monthly income accounts for Euro 1,563.14. (Table 1).

The main reasons why these tourists chose this hotel for one night accommodation were:

- The hotel is on the top three stars hotels in Hunedoara City (100% respondents).

-The proximity with the tourist attractions (84.11 %)

-The fact that these tourists were a group of colleagues who participated in this excursion and they needed accommodation, dinner and breakfast and a parking place for their coach at the same hotel;

-The good appreciations and comments found on internet on Booking.com and Trivago.com (52.94).

-For the good facilities offered by hotel on its site (100 %).

-For having a good rest and leisure (100%).

Evaluation of tourist satisfaction degree for hotel service quality

Respondents' satisfaction regarding hotel location, view, road accessibility and distance from tourist attractions

For each item of this criterion, a high percentage of the respondents appreciated as "Very good" and just a lower percentage as "Good". The only item where the opinions differed was "the distance from the main

tourist attractions", which was appreciated as "Very good" by 52.94 % respondents, as "Good" by 29.41 % and as "Satisfactory" by 17.65 %.

The score calculated for Location, View, and Road accessibility was equal to 4.94, a very good one, and the score for Distance from the tourist attractions was 4.35, also a good one.

The overall score accounted for 4.82 (Table 3).

Table 3. Customers' satisfaction for hotel location, view, road accessibility and distance from tourist attractions

	Very good	Good	Satisfactory	Unsatisfactory	Very unsatisfactory	Total	Score
	5	4	3	3	1		
Location							
Frequency	32	2	0	0	0	34	4.94
Percentage	94.12	5.88	0	0	0	100	
View							
Frequency	32	2	0	0	0	34	4.94
Percentage	94.12	5.88	0	0	0	100	
Road accessibility							
Frequency	32	2	0	0	0	34	4.94
Percentage	94.12	5.88	0	0	0	100	
Distance from the main tourist attractions							
Frequency	18	10	6	0	0	34	4.35
Percentage	52.94	29.41	17.65	0	0	100	
Total score							4.82

Source: Own calculations.

Respondents' satisfaction regarding the quality of check-in and reservation service is presented in Table 4. The following scores were recorded: 5 for Reservation service, 4.94 for check-in service timeliness and efficiency, and 5 for Reception service. The overall score was 4.98, a very good one.

Table 4. Customers' satisfaction for of check-in and reservation service quality

	Highly satisfied	Satisfied	Neither satisfied or dissatisfied	Dissatisfied	Highly dissatisfied	Total	Score
	5	4	3	3	1		
Reservation							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Check-in service timeliness and efficiency							
Frequency	32	2	0	0	0	34	4.94
Percentage	94.11	5.89	0	0	0	100	
Reception service							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Total score							4.98

Source: Own calculations.

Respondents' satisfaction regarding the quality of room service and comfort. The main aspects taken into consideration this criterion have been: room size, furniture and other endowment, bed size and comfort, cleanliness and hygiene, bed sheets quality, room decorations and design, air conditioned, TV channels, balcony, quietness for which the respondents answered " Highly satisfied", and the score was 5.

The only exception was Lightening, for which 88.23 % interviewees were highly satisfied and 11.77 % Satisfied, and as a result, the score in this case was 4.88 (Table 5).

Table 5. Customers' satisfaction for the quality of room service and comfort

	Highly satisfied	Satisfied	Neither satisfied or dissatisfied	Dissatisfied	Highly dissatisfied	Total	Score
	5	4	3	3	1		
Room size							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Furniture and other endowment quality							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Bed size and comfort							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Cleanliness and hygiene							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Bed sheets quality							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Room decorations and design							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Air conditioned							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
TV and channels							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Lightening							
Frequency	30	4	0	0	0	34	4.88
Percentage	88.23	11.77	0	0	0	100	
Balcony							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Quietness							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Total score							4.99

Source: Own calculations.

Respondents' satisfaction regarding the quality of bathroom service and comfort. In this case, the aspects regarding: bathroom space, bath space, endowment (bath, lavoir, toilet, furniture, mirror, shower installations etc), towels, toilet paper, cleanliness were taken into consideration. The scores received for these aspects were maximum 5 for almost all of them, except Endowment quality, referring only a few repairs needed between the bath and the faience, for which one respondent was only Satisfied, but 97.05% were Highly satisfied, probably in their rooms it was not noticed this problem. As a result of this last criterion, the score was 4.97, resulting the total score of 4.99 (Table 6).

Respondents' satisfaction regarding the quality of restaurant and bar services. In this case, there were appreciated the following aspects: restaurant space, menu diversity, food quality, beverages diversity, beverage quality, service speed, endowment and comfort, panorama view to the swimming pool, atmosphere (lightening and musical background), staff kindness and promptitude.

All the respondents (100%) declared that they are highly satisfied, and as a result the score for each aspect was 5 as well as the total score (Table 7).

Table 6. Customers' satisfaction for the quality of bathroom service and comfort

	Highly satisfied	Satisfied	Neither satisfied or dissatisfied	Dissatisfied	Highly dissatisfied	Total	Score
	5	4	3	3	1		
Bathroom space							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Endowment quality							
Frequency	33	1	0	0	0	34	4.97
Percentage	97.05	2.95	0	0	0	100	
Towels quality							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Toilet paper quality							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Cleanliness and hygiene							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Total score							4.99

Source: Own calculations.

Table 7. Customers' satisfaction for the quality of restaurant and bar services

	Highly satisfied	Satisfied	Neither satisfied or dissatisfied	Dissatisfied	Highly dissatisfied	Total	Score
	5	4	3	3	1		
Restaurant size							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Menu diversity							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Food quality							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Beverage diversity							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Beverage quality							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Servicing speed							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Comfort and endowment							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Panorama view							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Atmosphere							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Staff kindness and promptitude							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Total score							5

Source: Own calculations.

Photo 5. The group of tourists in the restaurant of the hotel.
Source: Original, Sept.14th, 2019.

Respondents' satisfaction regarding the quality of breakfast room and food diversity and quality.

For this criterion, the following aspects were evaluated by the interviewed tourists: breakfast room space, food diversity, food quality, personnel solicitude and kindness. For the last three aspects all the 34 tourist agreed that they were Highly satisfied and in consequence, the score was maximum, that is 5.

The only exception was the breakfast room space which looked to be too small at the same hour, more exactly 7.15 when almost everybody wanted to have breakfast and there were not enough places in the room. They had to wait a little, however not too much. For this reason, 88.23 % respondents affirmed that they were only satisfied regarding this aspect and in consequence, the score was 4.88 (Table 8).

Table 8. Customers' satisfaction for the quality of breakfast room and food diversity and quality

	Highly satisfied	Satisfied	Neither satisfied or dissatisfied	Dissatisfied	Highly dissatisfied	Total	Score
	5	4	3	3	1		
Breakfast room space							
Frequency	30	4	0	0	0	34	4.88
Percentage	88.23	11.77	0	0	0	100	
Food diversity							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Food quality							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Personnel solicitude and promptitude							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Cleanliness and hygiene							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Total score							4.98

Source: Own calculations.

Respondents' satisfaction regarding safety and security. All the respondents (100%) were highly satisfied from this point of view. Therefore, for this criterion, the score was also 5.

Respondents' satisfaction regarding staff professionalism and quality. This criterion included many aspects which have been appreciated by the respondents as follows: professionalism, kindness, helpfulness, thoughtfulness, availability, friendly, problem solving speed, communication efficiency in English, politeness and civilized behaviour. For all these aspects the respondents were highly satisfied, therefore, the partial scores are 5 and the total score is also 5 (Table 9).

Respondents' satisfaction regarding the correlation between the service quality and price was maximum as everyone affirmed that it was highly satisfied, therefore the score is 5.

Respondents' satisfaction regarding hotel service quality and its impact concerning

their wish to return. All the interviewed tourists said that they "Strongly agree" because it is really a wonderful hotel, and they had a marvelous stay here, much over their expectations (Table 10).

Table 9. Customers' satisfaction for staff professionalism and quality

	Highly satisfied	Satisfied	Neither satisfied or dissatisfied	Dissatisfied	Highly dissatisfied	Total	Score
	5	4	3	3	1		
Professionalism							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Kindness							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Helpfulness							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Thoughtfulness							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Availability							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Friendly attitude							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Problem solving							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Communication efficiency in English							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Politeness							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Civilized behaviour							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	
Total score							5

Source: Own calculations.

Table 10. Customers' satisfaction on hotel service quality and its impact on their wish to return

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total	Score
	5	4	3	3	1		
Do you want to return to this hotel?							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	

Source: Own calculation.

Respondents' satisfaction regarding hotel service quality and its impact concerning their wish to recommend this hotel to their friends, relatives and colleagues.

In this case, also the respondents affirmed that they would be delighted to inform their friends and relatives about their high quality accommodation and food service in relationship with the price they paid, so that they will recommend this hotel for sure (Table 11).

Table 11. Customers' satisfaction on hotel service quality and its impact on their wish to recommend this hotel to their friends, relatives and colleagues

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total	Score
	5	4	3	3	1		
Do you want to recommend this hotel to your friends, relatives and colleagues?							
Frequency	34	0	0	0	0	34	5
Percentage	100	0	0	0	0	100	

Source: Own calculations.

The global score for service quality in this hotel is centralized in Table 12.

Table 12. The global score for the quality of the hotel services

Analyzed quality criteria	Score
Hotel location, view, road accessibility and distance from tourist attractions	4.82
Quality of check-in and reservation service	4.99
Quality of room service and comfort	4.99
Quality of restaurant and bar services	5
Safety and security	5
Quality of breakfast room, food diversity and quality	4.98
Staff professionalism and quality	5
Correlation between service quality and price	5
The wish to return to this hotel for its high quality services	5
The wish to recommend this hotel to friends, relatives and colleagues for its high quality services	5
The global score for hotel service quality	4.98

Source: Own calculations.

Photo 6. Satisfied at the end of the stay in the hotel.
Source: Original.

Taking into account the partial score regarding service quality, the global score was 4.98, meaning that all the tourists appreciated the best quality of the hotel services.

CONCLUSIONS

The paper approached a large range of aspects which characterize service quality in a hotel proving the importance of quality in determining customer's satisfaction.

This hotel proved to be a model of how quality should be treated and deserved to receive a global score of 4.98, very close to the maximum, i.e.5.

Therefore, hotel managers must be aware of the importance of service quality in determining tourists to come back and suggest other people where to accommodate in the best conditions and have the satisfaction that the money they pay could be returned in the value of the offer that they receive.

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EFFICIENCY OF THE AGRICULTURAL LAND USE IN THE EUROPEAN UNION

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Abstract

The paper analyzed the efficiency of the utilization of the agricultural land in the EU-28 and in each country based on a system of specific indicators, among which the most important ones have been the agricultural production and gross value added per ha of utilized agricultural land. The data provided by Eurostat were processed establishing the average level in the decade 2009-2018 both at the EU and every country level. The comparison among countries was based on the EU- mean resulting in this interval. The results proved that 71.46 % (128.55 Mil. ha) of the EU-28 agricultural land is used by France, Spain, United Kingdom, Germany, Poland, Romania and Italy. About 77.58% of the EU agricultural output is produced by France, Germany, Italy, Spain, United Kingdom, Netherlands, Poland and Romania. The highest agricultural output per ha of used area was achieved by Malta, Cyprus, Belgium, Italy, Denmark, Germany, Luxemburg, Slovenia, Austria and France. About 86.65 % (Euro Bil. 144.72) gross value added is produced in agriculture by Italy, France, Spain, Germany, United Kingdom, Netherlands, Poland, Romania, Greece and Hungary. Only Italy, Spain, Greece, Cyprus, Croatia, Romania and Malta exceeds 40.95 %, the EU-28 average share of gross value added in the value of agricultural output. The EU achieved Euro 671.1 per ha of utilized land and 15 member states are able to exceed it (Malta, Netherlands, Cyprus, Italy, Belgium, Germany, Greece, Spain, Austria, Denmark, Slovenia, France, Luxemburg, Croatia and Portugal). As a conclusion, taking into account the two indicators: agricultural output and gross value added per ha of utilized area, the countries with the highest economic efficiency of land use are Malta, Cyprus, Italy, Belgium, Germany, Denmark, Austria, Greece, Slovenia, Luxemburg, France, Spain, Netherlands, Portugal and Croatia. To make land use more efficient in agriculture, farmers have to optimize the combination of production factors in order to grow agricultural production and gross value added per ha.

Key words**:** *agriculture, land use, efficiency, agricultural production value, gross value added, European Union*

INTRODUCTION

Agricultural land is the most precious capital because it is destined to "produce food for humans by cultivating crops and rearing livestock" [20].

Between the surface of agricultural land and the utilized area, it is a difference because not all the land is worked for many reasons. According to the definition given by European Commission**, "**utilized agricultural area includes arable land, permanent crops and grassland, kitchen gardens etc"[3].

The way in which agricultural land is used by farmers could led to economic efficiency or not.

The large heterogeneity of agricultural land geographical position, soil structure and quality, the diversity of climate conditions, technical endowment in working land, applied technologies, agricultural inputs for farming, labor productivity and farming practices have a deep impact on the level and growth rate of agricultural output and gross value added in the agriculture of the EU countries [12].

The value of agricultural output is determined by two factors: gross value added and intermediate consumption. Both gross value added and intermediate consumption have a positive influence, meaning that the higher their levels, the higher the agricultural output.

Agriculture is an important economic sector contributing to GDP. In some EU countries, its contribution has a high level, while in other member states the share of agriculture in GDP is lower [16].

The statistical data reflect an ascending trend in agricultural output and gross value added during the last decade, but from an EU country to another the situation is different. However, in 2016, the contribution of agriculture to the EU GDP decreased as the overall agricultural growth has been stagnating in comparison with the main competitors such as China, the US and Brazil [1].

In the EU-28, about 48 % of the area is represented by agricultural land, whose figure accounted for 171,228,500 ha in 2016. More than 50 % of the EU agricultural area is worked by four countries: France, Spain, United Kingdom and Germany [2, 8, 9, 19].

The EU agriculture is sustained by 10.321.200 holdings, of which about 66 % are small sized holdings less than 5 ha. About 67 % of the EU farms are situated in Romania (33%), Poland (14%), Italy (10%) and Spain (9%) [7].

A large variability concerning farm structures, endowment, labor force, and productivity are the main features of the EU agriculture, even at present, despite that the new member states adhered in different stages (2004, 2007, 2013). Most of farms have a small size and are typical semi-subsistence farms which reduce the speed of the land concentration mainly in the new member states [10, 11, 14,15, 17, 18].

The farm size varies from a country to another in a large scale from over 70 ha (Czechia, Slovakia, United Kingdom), between 50-70 ha (France, Germany, Denmark, Luxemburg), 25-50 ha (Ireland, Sweden, Finland, Netherlands, Belgium), 10-25 ha (Spain, Italy, Hungary, Portugal, Austria, Lithuania, Latvia, Bulgaria) and less than 10 ha (Poland, Romania, Greece, Slovenia, Croatia) [21].

More than 50 % of the agricultural area is worked by 3 % of the EU farms. The largest holdings with over 50 ha are concentrated in Luxembourg (52%), France (41%), United Kingdom (39%) and Denmark (35%) [3].

The Common Agricultural Policy has contributed to the development of agriculture stimulating the decline of the number of farms, the increase of farm size and its economic performance, the growth of the agricultural production value and GVA achieved in agriculture. Agricultural output is a result of the potential production factors (natural conditions, land, assets, human resources, applied technologies etc.) and the manner in which they are combined to assure a higher production, product quality, income and profit for farm managers. The highest potential in agricultural production is considered to belong to the Netherlands, Denmark, Luxembourg, the United Kingdom, Slovakia and Belgium [13].

The efficiency of the use of the agricultural area is one of the key factors having a substantial impact on the competitiveness of agriculture in the EU and on the volume, structure and quality of agricultural production. The EU enlargement and the applied agricultural policy programmes have favored the intensification of the agricultural output and tried to reduce the dissimilarities among the EU countries [2].

In this context, the objective of this study was to analyze the dynamics of the utilized agricultural land (ha UAA) in the EU-28 pointing out the differences among its member states regarding the surface used for agricultural purposes, the value of the agricultural production, the gross value added in agriculture, the efficiency of the use of agricultural land in terms of agricultural output and gross value added per ha UAA.

MATERIALS AND METHODS

Data collection

The data utilized in this study were collected from Eurostat Statistical Data base for the period 2009-2018. The period of ten years chosen in this research was considered to be able to diminish the impact of climate change on the level of indicators.

The following indicators have been taken into account at the level of the EU-28, and also by member state: (i)Utilized agricultural area (UAA), (ii)Value of agricultural production (VAP), (iii)Value of agricultural production per ha UAA, (iv)Gross value added in agriculture (GVA), (v)Share of GVA in VAP, and (vi)GVA per ha UAA.

Methods used for processing the data

Descriptive statistics was made using Excel facilities for the following indicators: UAA, VAP, VAP/ha UAA, GVA and GVA/ha UAA.

The statistical average and Standard deviation were of high importance in order to make the comparison among the EU member states regarding the level of these indicators. Therefore, the calculations were based on their well known formulas:

$$\bar{X}=\frac{\sum_{i=1}^{n} x_i}{n} \quad \text{and} \quad \delta^2\sqrt{\sum_{i=1}^{n}\frac{(x_i-\overline{X})^2}{n-1}}$$

where:

x_i= the values of the studied variable;

n=the number of items in the chronological series.

The Points Method was used to establish the rank of the EU countries based on the most important indicators reflecting the efficiency of the land use: VAP per ha UAA and GVA per ha UAA.

Also, Spearman rank-order correlation was estimated to prove the relationship between VAP/ha UAA and GVA/ha UAA, using the well known formula:

$$\rho = 1 - \frac{6\sum D^2}{N^3 - N}$$

where:

D= the difference of the ranks of the paired variables;

D^2 = the squared difference;

N= the items of the chronological series, more exactly, N=10, the decade 2009-2018.

The obtained results are presented in tables and graphics, of which just a part are included in this article.

RESULTS AND DISCUSSIONS

Utilized agricultural area

In the EU-28, the utilized agricultural area has slowly but continuously declined from 188.45 million ha in 2009 to 178.9 million ha in 2018, meaning a reduction of 5.07 % (Fig.1). Therefore, only 24.72 % of the EU surface is used for agriculture, despite that agricultural area accounts for about 48 %.

The average agricultural area utilized in the EU-28 in the analyzed decade was 179.78 million ha, meaning 6.42 million ha per a member state.

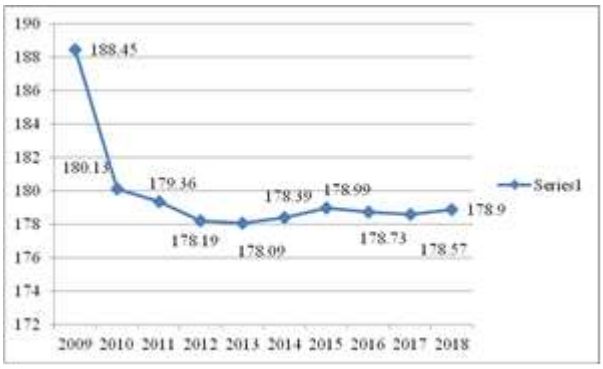

Fig.1. Dynamics of the utilized agricultural land in the EU-28 in the period 2009-2018 (Million ha)
Source: Own design and calculation based on [4].

The countries with a higher UAA than this mean of 6.42 million ha per country are: France, Spain, United Kingdom, Germany, Poland, Romania and Italy, all together summing 128.55 million ha, representing 71.46 % of the EU-28 UAA of 179.78 million ha. All the other countries used a smaller land area for agricultural purposes and as a result the share of their UAA in the European average is much lower (Table 1).

Therefore, there are large discrepancies regarding the UAA among the EU countries determined by the geographical position, relief forms, soil and climate conditions, agricultural systems and tradition in cultivating land.

The decline of the UAA at the EU-28 level was caused by the variations of UAA in each member state during the analyzed decade as shown in Table 2.

The figures show that there are no changes of the UAA in Spain, Luxemburg, Malta, Bulgaria and Denmark. In a few countries such as: Croatia, Lithuania, Cyprus, Estonia, Latvia, Slovenia and United Kingdom, the UAA was higher in 2018 compared to the 2009 level.

In most of the countries, the UAA declined in various proportions. The highest decrease, in the descending order, was noticed in France, Austria, Hungary, Poland, Greece, Netherlands, Italy and Portugal.

Table 1.The average agricultural utilized area in the period 2009-2018 by country of the EU-28

EU-28 UAA Average= 179.78 Million ha; Average UAA per member state= 6.42 Million ha					
Country	Average UAA, 2009-2018 Million ha	Share of the EU average %	Country	Average UAA, 2009-2018 Million ha	Share of the EU average %
Countries with over 6.42 Million ha UAA			Countries with less than 6.42 Million ha UAA		
1.France	29.66	16.49	8.Hungary	5.38	2.99
2.Spain	23.80	13.23	9.Greece	5.30	2.94
3.United Kingdom	17.28	9.61	10.Bulgaria	4.73	2.63
4.Germany	16.70	9.28	11.Ireland	4.50	2.50
5.Poland	14.61	8.12	12.Portugal	3.65	2.03
6.Romania	13.73	7.63	13.Czechia	3.51	1.95
7.Italy	12.77	7.10	14.Sweden	3.03	1.68
Total	128.55	71.46	15.Lithuania	2.87	1.59
			16.Austria	2.83	1.57
			17.Denmark	2.64	1.46
			18.Finland	2.27	1.26
			19.Slovakia	1.91	1.06
			20.Latvia	1.86	1.03
			21.Netherlands	1.83	1.01
			22.Croatia	1.38	0.76
			23.Belgium	1.33	0.73
			24.Estonia	0.96	0.53
			25.Slovenia	0.47	0.26
			26.Luxemburg	0.13	0.07
			27.Cyprus	0.11	0.06
			28.Malta	0.01	0.005

Source: Own calculation based on [4].

Table 2.The UAA variation by EU country, 2009-2018 (%)

Country	Percentage growth/decline, in 2018 vs. 2009 (%)	Country	Percentage growth/decline, in 2018 vs. 2009 (%)
1.France	-17.3	15.Ireland	-1.75
2.Spain	0	16.Greece	-6.37
3.United Kingdom	+1.1	17.Hungary	-7.62
4.Germany	-1.43	18.Bulgaria	0
5.Poland	-7.24	19.Portugal	-2.89
6.Romania	-1.55	20.Czechia	-0.60
7.Italy	-3.68	21.Sweden	-2.00
8.Croatia	+15.5	22.Lithuania	+9.7
9.Bekgium	-0.08	23.Austria	-16.14
10.Estonia	+7.50	24.Denmark	0
11.Slovenia	+2.10	25.Finland	-0.09
12.Luxemburg	0	26.Slovakia	-1.04
13.Cyprus	+1.33	27.Latvia	+5.46
14.Malta	0	28.Netherlands	-5.21

Source: Own calculation based on [4].

Value of agricultural production (VAP)

Agricultural production had in general an ascending trend, but it was disturbed by an inflexion in the period 2014-2016, when the economic accounts for agriculture showed that the EU-28 value of agricultural production stood at €405.0 billion at basic prices, being smaller by 2.8% compared to 2015 [1].

In the analyzed period, if we compare the level of 2018 versus the level of 2009, we may easily notice an increase. Thus, in the EU-28, the value of agricultural output increased by 26.53 % from Euro Billion 347.4 in 2009 to Euro Billion 435.8 in 2018 (Fig.2.)

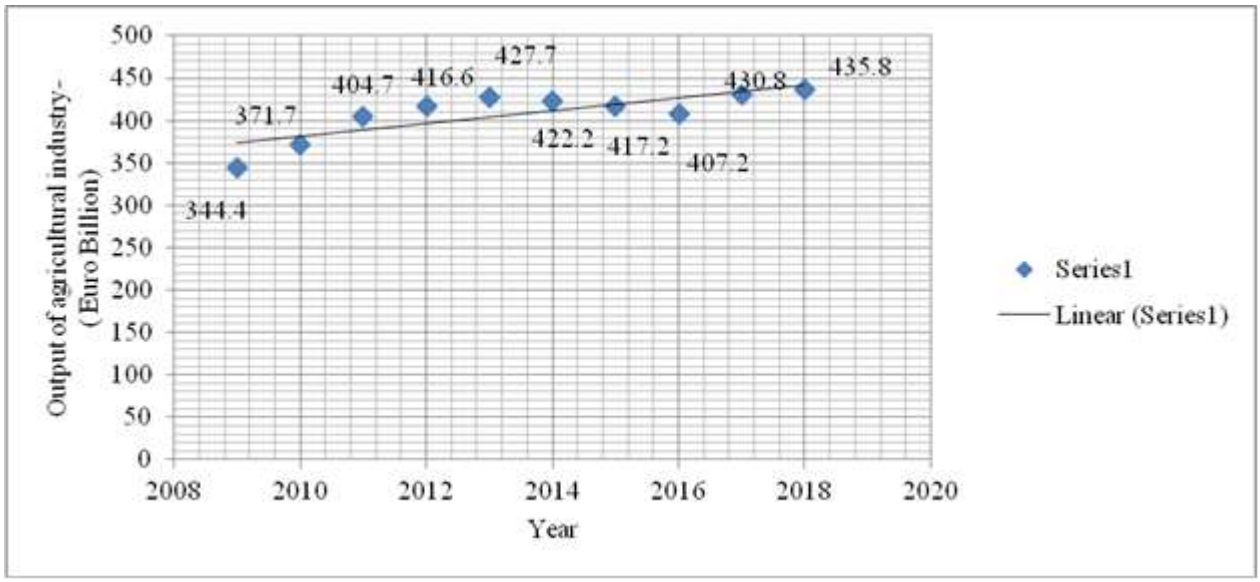

Fig.2.Dynamic of the agricultural production value, EU-28, 2009-2018 (Euro Billion)
Source: Own calculation and design based on [5].

However, Fig. 2 shows that in 2014, 2015 and 2016, the records regarding the value of agricultural output were lower than in the previous years. Of course, the level of agricultural production depends on many factors and their suitable combination: production organization and management, technological level, productivity, economies of scale, training level and skills of farm managers, but also on climate conditions which could favour or non favour agriculture [1].

The fact that agricultural output has a positive trend has contributed to the increase of agricultural sector in the EU economy. In 2018, the contribution of agriculture to EU GDP accounted for Euro Billion 183, representing 1.2 % of the whole GDP of the Community.

A positive aspect is the general ascending trend in the analyzed period noticed in almost all the EU countries, the highest growth being recorded by: Ireland, Lithuania, Latvia, Estonia, Hungary, Poland, Spain, Romania, Czechia and Luxemburg. However, in Croatia and Malta, the VAP declined in the last decade (Table 3).

Table 3.The percentage growth of the agricultural production value by country in 2018 vs.2009 (%)

EU-28 Growth rate= 26.53 %			
1.Ireland	+68.26	15.Slovenia	+23.80
2.Lithuania	+54.83	16.Netherlands	+23.55
3.Latvia	+52.32	17.Germany	+21.66
4.Estonia	+51.70	18. Portugal	+20.87
5.Hunagry	+50.70	19.Denmark	+19.52
6.Sweden	+44.20	20.France	+19.19
7.Poland	+42.21	21.Italy	+19.13
8.Spain	+40.72	22.Belgium	+16.59
9.Romania	+39.70	23.Cyprus	+10.60
10.Czechia	+39.18	24.Finland	+8.50
11.Luxemburg	+38.70	25.Bulgaria	+8.13
12.United Kingdom	+37.40	26.Greece	+5.39
13.Slovakia	+27.50	27.Malta	-0.08
14.Austria	+25.34	28.Croatia	-0.23

Source: Own calculation based on [5].

The value of agricultural production in the EU is given by the contribution of various sectors

operating in this field: 50.6 % coming from vegetal production (mainly from vegetables growing, fruit trees orchards and cereals cropping), 40.9 % from animal production (mainly dairy and pig farming) and 8.5 % from agricultural services.

The discrepancies regarding the contribution of the member states to the agricultural output of the EU is caused by the differences concerning agricultural production volume, crop and livestock [7].

The average agricultural production output at the EU level in the analyzed decade accounted for Euro Billion 408.83 with a standard deviation of 28.70 and a small variation coefficient of 7.03 %.

The average production value per member state was Euro Billion 14.46.

The countries which registered a higher average VAP over the EU-28 mean were: France, Germany, Italy, Spain, United Kingdom, Netherlands, Poland and Romania, all together summing 77.58 % share in the EU average agricultural output.

The smallest average VAP was carried out by Malta (Table 4).

Table 4. The average agricultural production value by EU country in the period 2009-2018 (Euro Billion)

EU-28 average VAP= Euro Billion 407.83; The average VAP per country = Euro Billion 14.56					
Country	Average VAP, Euro Billion	Share in the EU average VAP (%)	Country	Average VAP, Euro Billion	Share in the EU average VAP (%)
1.France	72.52	17.81	9.Greece	10.69	2.62
2.Germany	53.85	13.20	10.Denmark	10.43	2.55
3.Italy	53.62	13.14	11.Belgium	8.15	1.99
4.Spain	44.73	10.96	12.Hungary	7.64	1.87
5.United Kingdom	28.42	6.96	13.Ireland	7.08	1.73
6.Netherlands	26.92	6.60	14.Austria	6.91	1.69
7.Poland	22.51	5.52	15.Portugal	6.81	1.66
8.Romania	16.42	4.02	16.Sweden	5.92	1.45
Total	-	71.21	17.Czechia	4.71	1.15
			18.Finland	4.43	1.08
			19.Bulgaria	4.14	1.01
			20.Lithuania	2.69	0.65
			21.Croatia	2.46	0.60
			22.Slovakia	2.25	0.55
			23.Latvia	1.22	0.29
			24.Slovenia	1.18	0.28
			25.Estonia	0.81	0.19
			26.Cyprus	0.68	0.16
			27.Luxemburg	0.39	0.09
			28.Malta	0.12	0.02

Source: Own calculation based on [5].

In almost all the countries, the coefficient of variation for the value of agricultural production was below 10 %, except the following member states: Latvia (15.57 %), Lithuania (15.24%), Ireland (15.11 %), Croatia (14.83 %), Estonia (14.81%), Hungary (12.43%), and United Kingdom (12.10%).

Value of agricultural production per ha of utilized agricultural area

The VAP per ha UAA increased in the EU-28 by 33.27 % from 1,827 Euro/ha in 2009 to 2,435 Euro/ha in 2018 (Fig.3.) This growth was determined by the increased value of the agricultural production which had a positive effect, despite the decline of the UAA recorded in the most countries. The average value of VAP per ha UAA in the analyzed period accounted for 2,270 Euro/ha. The countries which recorded a higher value of the agricultural output per ha UAA in this interval, in the decreasing order, have been: Malta, Cyprus, Belgium, Italy, Denmark, Germany, Luxemburg, Slovenia, Austria and France (Table 5).

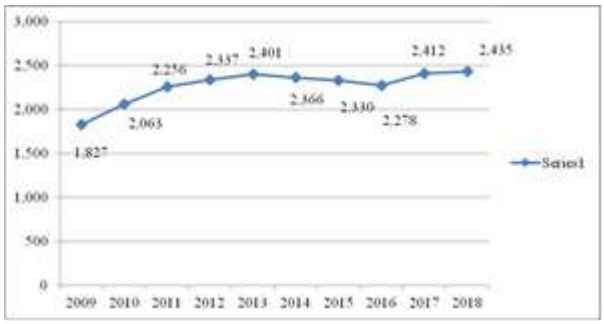

Fig.3.Dynamics of agricultural production value per ha utilized agricultural production (Euro/ha)
Source: Own calculation and design based on [4, 5].

Taking into account the top seven countries with the largest UAA, one may easily notice that the efficiency of the land use in terms of the value of agricultural production per ha UAA is the highest only in Italy, Germany and France, which are able to exceed the EU-average VAP per ha UAA of Euro 2,270.
Spain is situated on the 2nd position for UAA and on the 14th position for VAP/ha UAA. United Kingdom occupying the 3rd position for UAA is on the 17th position for VAP/ha UAA. Poland ranked the 5th for UAA is on the 19th position for VAP/ha UAA. Romania ranked the 6th for its UAA is on the 23rd position for VAP/ha UAA.
However, Malta, Cyprus, Belgium, Denmark, Luxemburg, Slovenia and Austria which occupied the 28th, 27th, 23rd, 17th, 26th, 25th and 16th positions for the UAA are among the top 10 countries with the highest VAP per ha UAA reflecting a high efficiency of the land use in the analyzed decade.

Table 5. The average VAP per ha UAA by country in the EU-28 in the decade 2009-2018 (Euro/ha)

EU-28 average VAP per ha UAA = 2,270 Euro					
Country	Average VAP/ha UAA Euro/ha	Share in the EU average VAP/ha (%)	Country	Average VAP/ha UAA Euro/ha	Share in the EU average VAP/ha (%)
1.Malta	12,010	+428.0	15.Portugal	1,865.5	-17.8
2.Cyprus	6,078.3	+167.7	16.Croatia	1,817.4	-20.0
3.Belgium	5,431.9	+139.2	17.United Kingdom	1,651	-27.3
4.Italy	4,190	+84.5	18.Ireland	1,576	-30.6
5.Denmark	3,951	+74.0	19.Poland	1,543	-32.1
6.Germany	3,223.6	+42.0	20.Netherlands	1,466.4	-35.5
7.Luxemburg	2, 999.3	+32.1	21.Hungary	1,423	-27.4
8.Slovenia	2,521.8	+11.09	22.Czechia	1,342.9	-40.9
9.Austria	2,460	+8.37	23.Romania	1,195	-47.4
10.France	2,458	+8.28	24.Slovakia	1,153.8	-49.1
11.Greece	2,018	-11.2	25.Lithuania	933	-58.9
12.Sweden	1,957.6	-13.8	26.Estonia	840.5	-63.0
13.Finland	1,950.5	-14.1	27.Bulgaria	823	-63.8
14.Spain	1,878	-17.3	28.Latvia	654.4	-71.2

Source: Own calculation based on [4, 5].

Gross value added in agriculture

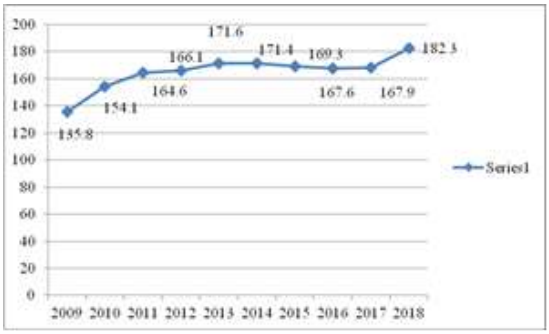

Fig.4. Dynamics of GVA achieved in the EU-28 agriculture, 2009-2018 (Euro Billion)
Source: Own calculation and design based on [6].

The gross value added (GVA) created in the EU-29 agriculture increased by 34.2 % from Euro Billion 135.8 in the year 2009 to Euro Billion 182.3 in 2018 (Fig. 4).
The average GVA obtained in the agriculture of the EU accounted for Euro Billion 167, meaning Euro Billion 5.96 in average per member state. The countries which exceeded the average GVA per country have been the following ones: Italy, France, Spain, Germany, United Kingdom, Netherlands, Poland and Romania (Table 6).

Table 6. The average GVA by country in the EU-28 in the decade 2009-2018 (Euro Billion)

EU-28 average GVA = Euro Billion 167; the EU average GVA per member state= Euro Billion 5.96					
Country	Average GVA UAA, 2009-2018 Euro Billion	Share in the EU average GVA per country (%)	Country	Average GVA UAA, 2009-2018 Euro Billion	Share in the EU average GVA per country (%)
1.Italy	30.27	+407.8	15.Ireland	2.00	-66.5
2.France	28.23	+373.6	16.Bulgaria	1.63	-72.7
3.Spain	24.21	+306.2	17.Sweden	1.60	-73.2
4.Germany	17.81	+198.8	18.Czechia	1.37	-77.1
5.United Kingdom	10.20	+71.1	19.Finland	1.23	-79.4
6.Netherlands	9.87	+65.6	20.Croatia	1.08	-81.9
7.Poland	8.71	+46.1	21.Lithuania	0.96	-83.9
8.Romania	7.10	+19.1	22.Slovakia	0.52	-91.3
9.Greece	5.42	-9.1	23.Slovenia	0.44	-92.7
10.Hungary	2.90	-51.4	24.Cyprus	0.30	-95.0
11.Austria	2.82	-52.7	25.Latvia	0.29	-95.2
12.Denmark	2.61	-56.3	26.Estonia	0.26	-95.7
13.Portugal	2.54	-57.4	27.Luxemburg	0.10	-98.4
14.Belgium	2.25	-62.3	28.Malta	0.05	-99.2

Source: Own calculation based on [6].

Greece is situated below the EU average GVA per country, but close to this figure, all the othre countries registered a lower GVA.

However, the GVA growth in the EU agriculture is a consequence of its increase in the member states. The highest GVA growth rate was recorded in Ireland, Hungary, Czechia, Slovakia, but also in Lithuania, Estonia, Slovenia, France, United Kingdom and Spain (Table 7).

Table 7. The growth rate of GVA by EU country in 2018 vs. 2009 (%)

EU-28 GVA Growth rate= 34.2 % in 2018 vs.2009 (%)			
1.Ireland	+215.8	15.Bulgaria	+34.80
2.Hungary	+119.76	16.Romania	+30.20
3.Czechia	+119.4	17.Germany	+27.43
4.Slovakia	+103.4	18. Sweden	+23.30
5.Lithuania	+54.23	19.Italy	+22.54
6.Estonia	+47.05	20.Latvia	+20.00
7.Slovenia	+44.7	21.Cyprus	+16.66
8.France	+44.51	22.Portugal	+14.62
9.United Kingdom	+44.29	23.Denmark	+11.78
10.Spain	+44.05	24.Belgium	-3.60
11.Austria	+40.44	25.Greece	-4.61
12.Poland	+39.94	26.Malta	-16.70
13.Netherlands	+38.14	27.Finland	-21.70
14.Luxemburg	+37.50	28.Croatia	-29.40

Source: Own calculation based on [6].

A number of five countries: Croatia, Finland, Malta, Greece and Belgium registered a decline of GVA in various proportions in the analyzed period.

The share of gross value added in the value of agricultural production

Taking into account the GVA and VAP at the EU level, the share of GVA in VAP increased from 39.09 % in 2009 to 41.83 5 in 2018. The average share in the analyzed decade was 40.95 % in the EU-28 (Fig. 5).

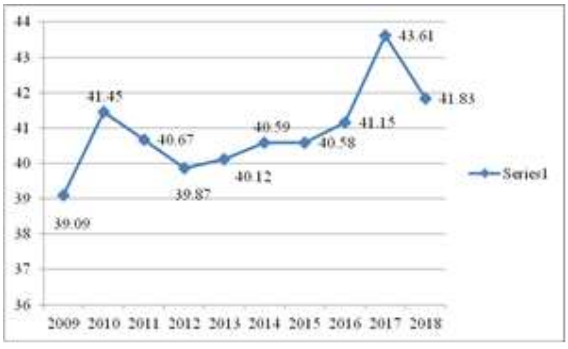

Fig.5.The share of GVA in VAP, the EU-28, 2009-2018 (%)

Source: Own calculation based on [5, 6].

The data from Table 8 show that the countries exceeding the EU-28 weight of GVA in VAP of 40.95 % have been: Italy, Spain, Greece, Cyprus, Croatia, Romania and Malta, which are followed by Austria, Bulgaria, France, Poland, Hungary, Portugal, Slovenia, Netherlands, United Kingdom, Lithuania and Germany.

Table 8. The share of gross value added in the value of the agricultural output by country in the period 2009-2018 (%)

The share of GVA in VAP in the EU-28 = 40.95 %			
Country	Share of GVA in VAP (%)	Country	Share of GVA in VAP (%)
1.Italy	56.45	15.Netherlands	36.66
2.Spain	54.12	16.United Kingdom	35.89
3.Greece	50.70	17.Lithuania	35.68
4.Cyprus	44.11	18. Germany	33.07
5.Croatia	43.90	19.Estonia	32.09
6.Romania	43,23	20.Czechia	29.08
7.Malta	41.66	21.Ireland	28.24
8.Austria	40.81	22.Finland	27.76
9.Bulgaria	39.37	23.Belgium	27.60
10.France	38.92	24.Sweden	27.02
11.Poland	38.69	25.Luxemburg	25.64
12.Hungary	37.95	26.Denmark	25.00
13.Portugal	37.29	27.Latvia	23.77
14.Slovenia	37.28	28.Slovakia	23.11

Source: Own calculation based on [5, 6].

Gross value added per ha of utilized agricultural area

In the EU-28, the GVA per ha UAA accounted for Euro 1,019 in the year 2018, being by 41.33% higher than in 2009 (Euro 721) (Fig.6).

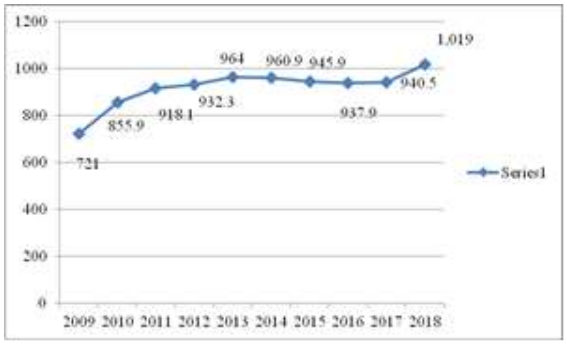

Fig.6.The share of GVA in the UAA, EU-28, 2009-2018 (Euro/ha UAA)
Source: Own calculation based and design on [4, 6].

The EU average GVA per ha UAA in the analyzed decade was 671.1 Euro/ha. A number of 15 countries carried out a higher GVA per ha UAA than the EU average. The top countries regarding the GVA per ha UAA are the ones where the agricultural land is used with high efficiency.

In the decreasing order, their hierarchy is the following one: Malta, Netherlands, Cyprus, Italy, Belgium, Germany, Greece, Spain, Austria, Denmark, Slovenia, France, Luxemburg, Croatia and Portugal. Other countries recorded a GVA per ha UAA below the EU average level (Table 9).

The GVA per UAA increased in the most of the EU countries with a few exceptions. The highest growth was recorded in Ireland, Hungary, Czechia, Slovakia, France, Austria, Poland, Luxemburg, Netherlands and Spain.

But, there are also countries where GVA per ha UAA was lower in 2018 compared to the level achieved in 2009. It is about: Croatia (-40%), Finland (-26.18%), Malta (-5.62%) and Belgium (-3.17).

The countries with a higher growth rate of GVA per ha UAA than the EU-28 growth rate of 41.33 % in the interval 2008-2009 have been: Ireland, Hungary, Czechia, Slovakia, France, Austria and Poland (Table 10).

Table 9. The average GVA per ha UAA by EU country in the period 2009-2018 (Euro/ha UAA)

The EU-28 average GVA per ha UAA = 671.1 Euro/ha					
Country	Average GVA per ha UAA Euro/ha	Share in the EU average GAV/ha (%)	Country	Average GVA per ha UAA Euro/ha	Share in the EU average GAV/ha (%)
1.Malta	5,848	871.4	15.Portugal	696.9	103.8
2.Netherlands	5,377.7	801.3	16.Poland	597.8	89.07
3.Cyprus	2,762.5	411.6	17.United Kingdom	590.6	88.00
4.Italy	2,375	353.8	18.Finland	545	81.20
5.Belgium	1,685.6	251.1	19.Hungary	543.5	80.98
6.Germany	1,066.7	158.9	20.Sweden	530.7	79.07
7.Greece	1,025.5	152.8	21.Romania	517.9	77.17
8.Spain	1,017.1	151.5	22.Ireland	459.8	68.51
9.Austria	1,008.3	150.2	23.Czechia	440.6	65.65
10.Denmark	988	147.2	24.Lithuania	334.8	49.88
11.Slovenia	967.3	144.1	25.Bulgaria	326.1	48.59
12.France	958.6	142.8	26.Slovakia	310.8	46.31
13.Luxemburg	809.4	120.5	27.Estonia	281.5	41.94
14.Croatia	796	118.6	28.Latvia	161.2	24.02

Source: Own calculation based on [4, 6].

Table 10. The growth rate of the GVA per ha UAA by country in the EU-28, 2009-2018 (%)

EU-28 growth rate of the GVA per ha UAA in 2018 vs.2009 = 41.33 %			
Country	GVA growth rate (%)	Country	GVA growth rate (%)
1.Ireland	+220.30	15.Bulgaria	+34.10
2.Hungary	+137.10	16.Latvia	+33.67
3.Czechia	+120.00	17.Romania	+32.26
4.Slovakia	+106.25	18. Germany	+30.55
5.France	+74.73	19.Italy	+27.20
6.Austria	+67.72	20.Sweden	+26.08
7.Poland	+50.90	21.Portugal	+18.05
8.Luxemburg	+47.44	22.Denmark	+12.24
9.Netherlands	+45.66	23.Cyprus	+6.06
10.Spain	+43.99	24.Greece	+1.90
11.United Kingdom	+43.94	25.Belgium	-3.17
12.Lithuania	+41.17	26.Malta	-5.62
13.Slovenia	+40.11	27.Finland	-21.18
14.Estonia	+34.95	28.Croatia	-40.00

Source: Own calculation based on [4, 6].

Table 11.The rank occupied by the EU countries based on VAP/ha UAA and GVA/ha UAA

Country	Rank	Country	Rank
1.Malta	1	15.Croatia	10
2.Cyprus	2	16.Finland	11
3.Belgium	3	17.Sweden	12
4.Italy	3	18.United Kingdom	13
5.Germany	4	19.Ireland	14
6.Denmark	5	20.Poland	14
7.Austria	6	21.Hungary	14
8.Greece	6	22.Romania	15
9.Slovenia	7	23.Czechia	16
10.Luxemburg	8	24.Lithuania	17
11.France	9	25.Slovakia	18
12.Spain	9	26.Bulgaria	19
13.Netherlands	9	27.Estonia	20
14.Portugal	10	28.Latvia	21

Source: Own calculation.

The rank occupied by the EU-countries based on the two land use efficiency indicators: VAP/ ha UAA and GVA/ha UAA

From this point of view, the countries with the highest economic efficiency of the utilization of the agricultural land are: Malta, Cyprus, Italy, Belgium, Germany, Denmark, Austria, Greece, Slovenia, Luxemburg, France, Spain, Netherlands, Portugal and Croatia. They are situated in the top of the hierarchy based on these two important indicators reflecting the efficiency of the land use.

The countries with the lowest efficiency of the land utilization in agriculture are Latvia, Bulgaria, Estonia, Lithuania and Slovakia (Table 11).

Spearman rank-order correlation

Using the ranks belonging to each country for the two key indicators reflecting the efficiency of the utilized agricultural land, the value of Spearman rank-order correlation was $r_S = 0.838$, reflecting a very strong relationship between the VAP and GVA per ha UAA, as it was expected, because, gross value added is a part of the agricultural production value.

CONCLUSIONS

The results of the research reflected a different degree of the efficiency in the utilization of the agricultural land among the EU countries.

This was determined by many factors among which the most important ones are: the geographic position on the EU map, the local conditions concerning relief, soil structure, characteristics, fertility, climate features regarding temperatures, precipitations regime, extreme phenomena (drought, floods, a.s.o.), the existence/non existence of irrigation systems, the technical endowment for working the land, the applied technologies, labor force qualification, experience in agriculture, land management, farm management, EU enlargement, the implementation of the Common Agricultural Policy in each country etc.

Despite of this large variety existing between the countries regarding the lad use efficiency, it was noticed a slight process of convergence grace to the strong CAP sustaining and stimulating farmers to improve, balance and optimize the combination of the production factors. The subsidies allotted per ha are of high importance in this respect.

The study proved that the efficiency of the land use in agriculture could be approached from many points of view and that the key indicators reflecting that in a country the agricultural land is higher or lower efficiently utilized are agricultural production and gross value added per ha of the UAA. The efficiency of a used ha in agriculture is reflected by how much agricultural production and gross value added is obtained. Therefore, farmers have to strengthen their efforts to find the best solutions to assure the optimization of the land use in combination with all the other production factors in order to grow agricultural production and gross value added per utilized ha, that is to make land use more efficient in the EU agriculture.

The Common Agricultural Policy is continuously reforming and adapting to the new challenges agriculture is facing. It keeps pace with the advanced results in agricultural sciences and technological progress and establish further changes for the prospect 2020 in order to increase the efficiency of the production factors (land, capital, labour, knowledge and entrepreneurship) in agriculture, agricultural production value and gross value added, to satisfy much better the needs of the EU population for food and improve farmers' income and living standard.

This study is just a beginning in studying efficiency of the land use, and further researchers will take into account many other factors which could raise the efficiency of agricultural land management.

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ANTIBIOTIC RESISTANCE MICROORGANISMS IN RAW MILK AND IMPLEMENTATION OF SANITATION STANDARD OPERATING PROCEDURE (SSOP) DURING MILKING PROCESS

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Abstract

The spread of antibiotic resistance microorganisms is currently one of the most important safety issues including raw milk and milk products. Contamination of microbes occurs during milking, shortly after milking until the milk is consumed. Contamination could come from the environment, workers, equipment, cages, animals, feed and water. To reduce the risk of microbial contamination application of Sanitation Standard Operating Procedure (SSOP) during milking process is absolutely necessary. The aims of this study were to determine antimicrobial resistance of Staphylococcus aureus, Escherichia coli and Salmonella isolated from raw milk and the implementation of SSOP during milking process. The results showed that with the average level of SSOP implementation in milking process of 61.85% or 20 SSOP, the antimicrobial resistance qualitative examination were found that the milk samples consisted of E. coli, Staphylococcus aureus and Salmonella. The antibiotic resistance profiles were tested to 3 antibiotics. It showed that 44.44% E. coli, 22.22% Staphylococcus aureus, and 11.11% Salmonella were resistance to chloramphenicol, where as all bacteria (100%) were resistance to trimethoprim and 11.11% E. coli were resistance to ampicillin.

Key words**:** *bacteria, antibiotics, resistance, milk*

INTRODUCTION

Milk is one of the most important food commodities in the world because it contains important elements that are balanced and easily digested to build and nourish the body. Almost all races in the world consume milk [2]. Milk contains high-grade protein, consisting of 18 percent whey protein and 82 percent casein containing essential amino acids. Milk contains minerals such as calcium, phosphorus, magnesium, and potassium.

The production of domestic fresh milk and milk products is still constrained on the production capacity, sustainability and quality of milk produced. To produce quality milk and safe to consume, good handling and managemant is needed from the beginning of milk production.

Contamination occurs shortly after milking until the milk is consumed. Contamination can come from outside the udder or the environment such as workers, equipment, cages, animals, feed and water. The quality management of fresh milk production is absolutely necessary to reduce the risk of microbial contamination and growth in milk. Good Dairy Farming Practices, immediate post-dairy handling, and good distribution should be applied to produce fresh, quality and safe milk. Good Dairy Farming Practices (GDFP) is the first step in quality management and safety of milk and dairy products at farmer level. The quality and safety management program is the implementation of the milking sanitation procedure known as Sanitation Standard Operating Procedures (SSOP) milking process. GDFP and SSOP this milking process is a prerequisite when someday companies want to obtain the Hazard Analysis Critical Control Point (HACCP) certificate.

The quality of fresh milk must meet the standards set in Indonesia, which is based on SNI No. 01-3141-2011 regarding the Quality Standard of Fresh Milk [13]. One of the characteristics of fresh milk that plays an important role is contamination of microbes and contaminants in addition to other

contaminants contained in it, such as antibiotics and mycotoxins.

Some bacteria have a natural ability to resist with antibiotics even if they do not interact directly. This can happen because bacteria have enzymes that can inhibit antibiotic work [5]. The usual antibiotics given to cows include oxytetracycline, ampicillin, penicillin (a class of penicillin antibiotics); penstrep (combination of penicillin and cephalosphorin) and sulfadiazine group antibiotics. Bacteria that are resistant to antibiotics are thought to contribute to the high content of microbial contamination in milk.

The aims of this study were to determine and antimicrobial resistance of *Staphylococcus aureus, Escherichia coli* and *Salmonella* isolated from raw milk and correlation the presence of those bacterias with SSOP application during milking process which can then be identified factors that cause the degradation of the quality of fresh milk.

MATERIALS AND METHODS

This study consists of 3 stages:

(i)Identify the implementation of SSOP of milking process by dairy farmers. A total of 97 respondents of milk cooperative members were interviewed to find out the application level of 33 SSOP variables that were built based on cooperative milking SOP and FDA (2015) [7].

The 33 variables of milking process SSOP are:

(1)Milk from a sick animal is always separated
(2)Throw 3 - 4 first milk juice
(3)Clean the cage from the dirt
(4)Filter the milk to be put into the milk can
(5)Bring milk immediately to the shelter after dairy
(6)The cage has a good lighting system, day and night
(7)There is a good drainage channel
(80Drying hands after washing hands with a clean cloth
(9)Milking in the right way
(10)Cages have good air circulation
(11)The enclosure enclosure is made of a material that is easy to clean and not slippery
(12)Cook water until it boils to clean the milking apparatus and wipe the udder
(13)Stainless steel or aluminum container bucket
(14)Wiping the udder dry
(15)Workers are always ascertained in good health
(16)Separate cages with other animal enclosures
(17)Clean the udder with warm water before milking
(18)The water used meets the criteria of clean water
(19)Cleaning the milking equipment with soap
(20)Special place of storage of appliances and in clean condition
(21)Rinse the milking tools with hot water
(22)Bathing the cow before dairy
(23)Tie the cow's tail when milked
(24)Hand washing using soap before dairy
(25)The feeding area is separate from the enclosure
(26)Dipping the nipple into the iodine solution after milking
(27)Clean cage roof
(28)There is a special room for storing tools
(29)Drying the milking equipment by drying
(30)Using clean clothes during dairy
(31)Having a litter bin
(32)Separate milking room and cages.
(33)Cool down immediately after milking up to 4 ^{o}C.

(ii) Escherichia coli, Staphilococcus aureus and Salmonella isolation

Samples of milk was taken from 9 dairy farmers, collected and cooled immadiately at 4^{o}C and brought to the laboratory..

E. coli

Each sample was enriched in pre-enrichment buffer peptone water (BPW) and incubate at 38^{o}C for 48 hours. Each innoculum was streak on Eosin Methilene Blue (EMB).

S. aureus

Each sample was enriched in pre-enrichment buffer peptone water (BPW) and incubate at 38^{o}C for 48 hours. 0,1 ml suspension was

inoculated on Baird Parker Agar at 37^{o}C for 48 hours.

Salmonella spp

Each sample was enriched in pre-enrichment buffer peptone water (BPW) and incubate at 38^{o}C for 48 hours. Bacteria suspension was innoculated in Xylose Lysine Desoxycholate (XLD).

(iii)Antibiotic resistance analysis

Each bacterial colony was tested for resistance to chloramphenicol antibiotics, trimethroprim and tetracycline. Determination of antibiotic doses was performed on the basis of MIC (minimal inhibitory concentration). Based on the results of the Soleha (2015) [18] study, MICs for chloramphenicol, tetrsycline and trimethoprim were 30µg, 30µg, and 5µg, respectively. Testing of microbial resistance to antibiotics is done by antibiotic resistance test by method so that the diffusion is done by way of wells [1] [14].

In the diffusion method, the media used is Mueller Hinton and the method used is the way of the well. The 10^{8}CFU / ml bacterial suspension is flattened on agar medium, then for a particular center line to be made according to need. The antibiotic solution used is dripped into the well. Incubated at 37°C for 18-24 hours. Read the results, as in the Kirby-Bauer way [15].

RESULTS AND DISCUSSIONS

The results of the implementation of SSOP can be presented in Table 1 which shows that not all SSOPs are implemented by all farmers, the highest value is SSOP "Milk originating from sick animals always separated" is implemented by 84 respondents or 86.6%. None of the respondents had a milking room separate from the milking parlor and that cooled the milk directly after milking up to 4°C. Both of these SSOP variables are critical points of microbial contamination in milk.

Table 1 shows that 6 samples from 9 tested samples (66.67%) positive contain *E. coli* ie samples A, B, C, E, H, and I. Three (3) samples originating from breeders with application of SSOP process milking "Low" entirely positive contains E. coli.

Each of two samples from breeders with SSOP application of "Intermediate" and "Low" positive milking processes contain *E. coli*. This means that all levels of SSOP implementation are polluted by *E. coli.*

Table 1. Percentage of SSOP Implementation of Milking Process by Farmers (%)

No	Farmers Who Implemented SSOP (People)	Percentage of Farmers Who Implement SSOP (%)
1	84	86.6
2	84	86.6
3	82	84.5
4	79	81.4
5	76	78.4
6	77	79.4
7	74	76.3
8	75	77.3
9	74	76.3
10	74	76.3
11	72	74.2
12	72	74.2
13	71	73.2
14	72	74.2
15	71	73.2
16	71	73.2
17	69	71.1
18	68	70.1
19	63	64.9
20	62	63.9
21	60	61.9
22	61	62.9
23	60	61.9
24	58	59.8
25	57	58.8
26	53	54.6
27	50	51.5
28	47	48.5
29	38	39.2
30	31	32
31	25	25.8
32	0	0
33	0	0

Source: Own results.

Table 3 shows that 5 samples (55.56%) positive contain *S. aureus*, ie samples B, D, F, and I. This means that all levels of SSOP application of the milking process are polluted by *S. aureus*. Two samples come from breeders who implement SSOP milking process "High" and "Intermediate".

One sample came from a breeder with a "Low" implementation of SSOP milking process.

Table 2. *E. coli* Isolation Result

Implementation of SSOP	Sample	Replication		
		1	2	3
"High"	A	-	-	-
	B	-	-	+
	C	-	-	+
"Intermediate"	D	-	-	-
	E	+	-	+
	F	-	-	-
"Low"	G	+	+	-
	H	+	+	-
	I	-	-	+

Source: Own results.

Tabel 3. *S. aureus* Isolation Result

Implementation of SSOP	Sample	Replication			
		10^{-1}		10^{-2}	
"High"	A	-	-	-	-
	B	8	4	-	-
	C	-	-	-	-
"Intermediate"	D	1	3	-	-
	E	-	-	-	-
	F	4	-	-	-
"Low"	G	-	13	-	-
	H	-	-	-	-
	I	6	19	-	-

Source: Own results.

Table 4. shows that 1 sample (11.1%) positively contains Salmonella.

Table 4. Salmonella Isolation Result

Implementation of SSOP	Sample	Replication	
		1	2
"High"	A	-	-
	B	-	-
	C	-	-
"Intermediate"	D	-	-
	E	-	-
	F	+	+
"Low"	G	-	-
	H	-	-
	I	-	-

Source: Own results.

This is a sample derived from a breeder with the application of "intermediate" SSOP milking process implementation.

After isolation, bacteria were found to be tested for resistance to antibiotics of chloramphenicol (30 μg), tetraskilin (30 μg) and trimethoprim (5 μg). The dose and standard used refers to Soleha (2015) [18] presented in Table 5.

Tabel 5. Standard Diameter Interpretation Zone for Determination of Microbial Sensitivity Criteria against Antibiotics

Antibiotics	**Zone Diameter (mm)**		
	Resistant	Intermediet	Sensitive
Chloramfenikol (30 μg)	<12	13 – 17	> 18
Tetraskilin (30 μg)	<14	15 – 18	>19
Trimetoprim (5 μg)	<10	11 – 15	>16

Source: Own results.

Table 6 shows that of from 9 isolates, 4 isolates of *E. coli*, 2 isolates of *S. aureus* and 1 isolate *Salmonella* (77.8%) proved resistant to chloramphenicol. All bacterial isolates are resistant to trimethoprim (100%). Only 1 isolate of E. coli was resistant to ampicillin (11.1%).

All milk samples from breeders applying the SSOP of the "low" positive milking process *contain E. coli* which is resistant to the three types of antibiotics tested. Milk samples from breeders applying the "good" milking SSOP, still contain S. aureus and Salmonella which are resistant to chloramphenicol and trimethoprim.

The overuse of antibiotics in the livestock industry has led to a high diversity of various antibiotic resistance genes (ARGs) found in manure [11] [3].

Animal waste is one of the contaminants in milk. Contamination of impurities containing antibiotic-resistant microbes is also suspected to be propagated through manure [17]. The process of aerobic composting of cattle manure is suspected to be a cause of antibiotic resistance [4].

Staphylococcus aureus is one of the causes of mastitis in cows and may contaminate milk throughout its supply chain, causing high milk microbial contamination and possible Staphylococcal food poisoning (SFP) toxicity [16]. The prevalence of milk contamination by *Staphylococcus aureus* is resistant to antibiotics in fresh milk varies, reported 51% to 91% [8] [9].

Table 6. Inhibitory Zone of EC, SA and SAL bacteria against chloramphenicol antibiotics, trimethoprim and tetracycline

Code	Inhibitory Zone Diameter (mm)					
	A (chloramphenicol)		B (trimethoprim)		C (tetracycline)	
	Inhibitory Zone (mm)	Criteria	Inhibitory Zone (mm)	Criteria	Inhibitory Zone (mm)	Criteria
EC-A	9.65	Resistant	6.85	Resistant	21.80	Sensitive
EC-B	11.13	Resistant	0	Resistant	17.00	Intermediet
EC-C	17.75	Intermediet	3.5	Resistant	9.50	Resistant
EC-E	9.50	Resistant	0	Resistant	25.65	Intermediet
EC-H	8.88	Resistant	0.65	Resistant	16.25	Intermediet
SA-B	14.15	Intermediet	0	Resistant	16.49	Intermediet
SA-D	11.00	Resistant	0	Resistant	19.35	Sensitive
SA-F	9.65	Resistant	0	Resistant	15.15	Intermediet
SAL-G	10.55	Resistant	0	Resistant	15.65	Intermediet

Source: Own results.

S. aureus resistant to antibiotics began to emerge several decades ago due to widespread and often inaccurate use of antibiotics and doses in livestock. Despite the limitation of use, both clinically and in food production, the trend of increased antibiotic resistance continues [6] [10] . The sources of *S. aureus* contamination are, among others, the result of dairy farm sites that are too close to animal cages [12]. Survey results show (Table 5) that 29% of breeders place their cages adjacent to other animal enclosures, thus increasing the likelihood of contamination of antibiotic-resistant microbes.

CONCLUSIONS

The level of implementation of SSOP milking process by breeders is only an average of 61.85% or 20 SSOP. The highest level of SSOP implementation by breeders is 30 SSOP (80%) and lowest 10 SSOP (30.30%).

There are bacteria that are resistant to antibiotics. Of the 9 isolates tested, 4 isolates of *E. coli* (44.44%), 2 isolates of *S. aureus* (22.22%) and 1 isolate *Salmonella* (11.11%) proved resistant to chloramphenicol. All bacteria isolates are resistant to trimethoprim. Only 1 isolate of *E. coli* is resistant to ampicillin.

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INNOVATIVE DEVELOPMENT OF GRAIN PRODUCTS SUBCOMPLEX AS THE DRIVER OF NATIONAL FOOD SECURITY PROVISION

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Abstract

The research is devoted to problems of national food security provision. Issues of grain production innovative development were under study. The aim of the article was to identify trends and factors that determine the impact on improving the efficiency of grain subcomplex business entities economic activity. The study was conducted on the basis of state statistics of Russian agriculture development in 2010 – 2017. The results of the study show that there is a reduction of the fertilizer application influence determinants along with the enhancement of the degree of technical equipment as drivers of the grain product complex development. Resources for further growth of grain productivity due to the application of mineral fertilizers are exhausted. Further broader use of inorganic substances will designate the abatement of grain organoleptic characteristics, along with the upturn of soil mineralization parameters, which will naturally clarify its degradation. The upturn of business entities equipment marks with agricultural machinery as a reserve for the growth of grain productivity level has also exhausted its influence. It is determined that increasing the level of national food security requires the development of new innovative ways to improve the efficiency of grain production. This situation is particularly relevant from the standpoint on recent risk connected with agroindustrial production, along with strengthening the policy of sanctions and trade restrictions in world economy. Operational and strategic ways of grain subcomplex innovative development were defined.

Key words: *innovations, development, food security, grain production, agriculture*

INTRODUCTION

The problem of food security provision and agricultural production development is decisive from the point of view of national interests' advancement and protection. Having a stable position in international food markets is an important tool for achieving economic and political leadership in the modern world. Modern policy of sanctions and trade restrictions shows high actuality of the researched sphere.

In this case, a special role is played by the output of farming industry (its grain branch), which is the ground for fabrication of strategically important food commodity items. Researched branch of farming industry forms the raw-material base for the fabrication of feed and, accordingly, livestock products. The increase of competition in the world grain markets, as well as increased tensions in international politics – significantly affect the parameters of the agro-industrial business structures functioning.

In these conditions, the most important resource for success in the competition is innovation, ensuring the growth of labor efficiency, productivity and capacity of major crops, which respectively determines the reduction of costs and increase profitability. Business efficiency along with state support form preconditions for strategic development of agrarian sector, form resource base for its research and development branch.

The problem of farming industry grain branch in the Russian Federation has been identified as the subject of a series of scientific researches. Theoretical framework of the study concerns the results of well known scientific works of scientists from Russia and

other countries who focuses their attention on the shortcomings of agroindustrial innovative development. In this case, we should mention works of A.I. Altukhov [1; 2; 3], J.V. Chutcheva and T.S. Mahmudova [4], S.A. Sharipova [15], P.A. Eriasheva [5], T.I. Gulyaeva and O.V. Sidorenko [7]. Significant results were obtained in works devoted to the progress of farming industry grain branch in certain regions of Russia. Notably, the issues of grain output in Siberia [10], Saratov [17] Amur [12], Bryansk [16] regions were studied. Peculiar focus is to be made on the research results of Ukrainian farming industry grain branch [8; 9; 13].

Despite the considerable scientists' regard, problems of Russian farming industry grain branch innovative development remain poorly studied. It should also be noted that investigation of the outlined group of issues is worth to be performed with regard to present problems in the sphere of national food security insuring.

MATERIALS AND METHODS

Investigation grounds on the base of information formed by official statistics data of the Russian Federation [14], Food and Agriculture Organization of the United Nations [6], financial and operative reports of agrarian business entities. Research covers the period of 2010 – 2017. As the information base were also used programme regulations of Russian Government and local administrations. The study is based on the complex use of research methods set. During the research routine were used financial analysis tools, statistics method, historical and monographic methods.

RESULTS AND DISCUSSIONS

At the present stage of Russian agro-industrial production development there are positive trends in the field of innovative activity of business structures. Since 2016, domestic agricultural producers have started the production of innovative products (Table 1).

Thus, the policy of resisting foreign sanctions and the protectionist response started to bear results only two years after their imposition. The Russian Federation continues to be a producer of primary agricultural commodities, which are largely export-oriented. The domestic market of finished food products remains largely dependent on imports.

There is a significant need to increase the depth of Russian agricultural raw materials processing entire the country. To a large extent this applies to grain crops. High rates of grain yield bring Russia to the leading position in world grain exports, but this kind of expansion leads to the development of the opposite effect. There is a decline in world grain prices. Grain production and export lose their commercial attractiveness.

Table 1. Main indicators of innovative activity in Russian national economy and agro-industrial production (2012 – 2017)

	2012	2013	2014	2015	2016	2017
Produced and shipped goods, performed works and services by domestic business entities, trln. Rubles. including:	35.9	38.3	41.2	45.5	51.3	57.6
- innovative products, works, services	2.9	3.5	3.6	3.8	4.4	4.2
Share of innovative goods, works, services in total volume of the shipped goods, performed works and services, %	8	9.2	8.7	8.4	8.5	7.2
Shipped innovative agricultural products, billion rubles including:	0	0	0	0	22.2	28.4
- plant growing	0	0	0	0	6.5	11.5
- farming	0	0	0	0	14.9	16.6
- mixed agriculture	0	0	0	0	0.6	0
- providing services in the field of plant growing, ornamental horticulture and animal husbandry, except veterinary services	0	0	0	0	0.1	0.3

Source: Federal State Statistics Service of Russia, http://www.gks.ru/ [14].

At the same time, it should be taken into account that the entire Russian economy on average for 2010 – 2017 did not produce more than 8% of innovative products. Agriculture did not participate in the innovation process and, accordingly, accumulated a significant backlog.

Fertilize activity

Dynamics of grain production indicators (and its features) in Russia in the period of 2010 –

2017 can be traced on the basis of the following analytical data (Fig. 1, Table 2).

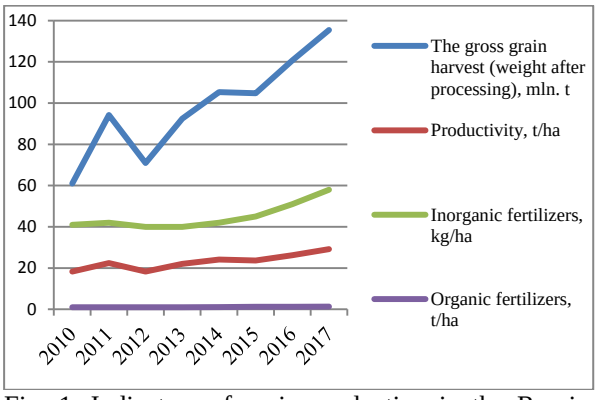

Fig. 1. Indicators of grain production in the Russian Federation (2010 – 2017)
Source: Federal State Statistics Service of Russia, http://www.gks.ru/; FAO, http://www.fao.org/home/en/ [6 ; 14].

Table 2. Indicators of grain production in the Russian Federation (2013 – 2017)

	2013	2014	2015	2016	2017
The gross grain harvest (weight after processing), mln. t	92.4	105.3	104.8	120.7	135.4
Productivity, t/ha	22	24.1	23.7	26.2	29.2
Inorganic fertilizers, kg/ha	40	42	45	51	58
Organic fertilizers, t/ha	1	1.1	1.2	1.2	1.3

Source: Federal State Statistics Service of Russia, http://www.gks.ru/; FAO, http://www.fao.org/home/en/ [6 ; 14].

In this case, we have analyzed the data on the gross grain harvest (in weight after processing), their yield, as well as the volume of organic and inorganic fertilizers.
The presented data make it possible to draw a conclusion about the decrease in the efficiency of Russian grain subcomplex. The growth of gross harvest significantly exceeds the dynamics of yield, which indicates only that the positive dynamics of grain harvest due to the increase in acreage. However, in our opinion other circumstances deserve attention. In 2015 – 2017, the dynamics of inorganic fertilizers significantly exceeded the rates of yield, which can point out a reduction in the impact of the mineral fertilizer determinant on the output of farming. In the meantime, the application of organic fertilizers remains at a low level and does not show significant positive dynamics.

The main drivers of growth in grain yield of crops is the usage of inorganic fertilizers. Application of organic fertilizers does not correspond to the degree of the enhance of the inorganic stuff application. Occurs the enlargement of the space of cultivated land. Thus, we should talk about the strict need for the introduction of new technologies and innovations in the farming industry grain branch of Russian agriculture. This is important in terms of food security because of the significant risks in crop production. A significant part of the Russian agricultural areas are in the zone of risky agriculture. This negative factor requires appropriate compensation, which is also due to significant climate change. Water scarcity is becoming a common phenomenon in the regions, with sufficient water resources were free available for a long time.
These conclusions are confirmed on the basis of the analysis of growth rates of the above indicators (Fig. 2, Table 3).

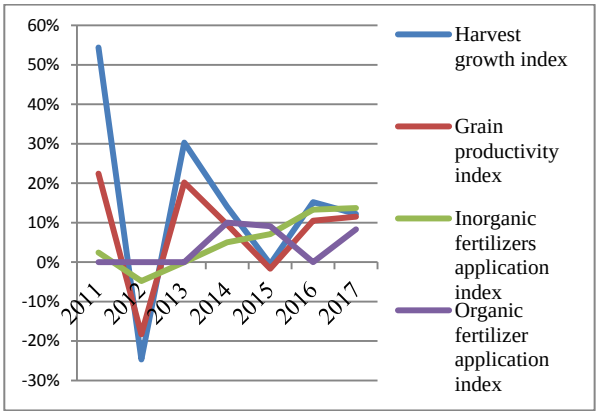

Fig. 2. Growth indices of grain production in the Russian Federation (2010 – 2017)
Source: Federal State Statistics Service of Russia, http://www.gks.ru/; FAO, http://www.fao.org/home/en/ [6; 14].

Table 3. Growth indices of grain production in the Russian Federation (2013 – 2017)

	2013	2014	2015	2016	2017
Harvest growth index	30.3%	14.0%	-0.5%	15.2%	12.2%
Grain productivity index	20.2%	9.5%	-1.7%	10.5%	11.5%
Inorganic fertilizers application index	0%	5%	7.1%	13.3%	13.7%
Organic fertilizer application index	0%	10.0%	9.1%	0%	8.3%

Source: Federal State Statistics Service of Russia, http://www.gks.ru/; FAO, http://www.fao.org/home/en/ [6; 14].

In the situation of sustainable growth of inorganic substances volume fertilized by farmers, there is instability in the values of the resulting yield. Traditional, conservative methods of increasing the productivity of grain crops show a decrease in efficiency.

Quality of output

Worth to mention that such aspect of increase in volumes of gathering grain crop and its productivity as quality of the received production. This parameter in modern conditions is inversely proportional to productivity and gross yield. This problem is devoted to the work of Meleshkina E. P. [11] In the context of the elaboration of the researched food market and enhancing attractiveness the southern regions of the country (Rostov, Krasnodar and Stavropol Regions), producers have shifted to the production of relatively lower quality classes of grain (mainly 4^{th}).

Traditionally, the southern region is considered to be the breadbasket of Russia, which used to grow the strongest and most valuable quality grain – high-quality, high-glass with a high content of good quality gluten. The orientation of the primary territories of commodity fabrication specializing in the cultivation of grain (predominantly IV category) due to formed demand for wheat of low quality has led to a further decline in the quality of Russian wheat. In contrast to the period when the share of food grain gradually began to increase at the expense of the 3rd and 4th classes, in modern conditions the share of wheat of the IV and V classes rises, and the characteristics of wheat in the Central and Volga Federal districts already becomes traditionally higher than in the southern district. In modern conditions, we can expect the rate of decline in quality is lower than before [11].

Technical provision

It is also important to study the impact of agricultural producers' technical provision on the results of grain cultivation.

The factor of capital and technical security is decisive from the point of view of achieving technical perfection in production processes. We also note that the availability of modern technology significantly increases productivity. Accordingly, all this affects the financial performance of grain producers.

Increase in quality and quantity of the let-out equipment for agriculture in Russia allows to solve problems of increase of technical security of agricultural producers. In this case, it is noteworthy that even under the conditions of foreign financial and economic sanctions, Russia in 2016-2018 became an exporter of agricultural machinery, in particular harvesters. Analysis of agricultural machinery provision gives information base for further conclusions in the sphere of grain productivity.

With this aim, the indicators of the number of crop productivity and agricultural machinery produced in the Russian Federation were analyzed (Table. 4).

Table 4. Park of agricultural machinery produced in the Russian Federation (2012 – 2017)

	2012	2013	2014	2015	2016	2017
Park of agricultural machinery, thousand units						
Tractors	276.2	259.7	247.3	233.6	223.4	216.8
Ploughs	76.3	71.4	67.8	64.1	61.6	59.7
Cultivators	108.7	102.2	97.8	93.2	90.3	87.6
Seeders	115.4	107.5	100.7	93.6	87.8	82.8
Grain combines	72.3	67.9	64.6	61.4	59.3	57.6
Produced agricultural machinery, thousand units						
Tractors	12.5	7.6	6.7	5.1	6.4	7.2
Ploughs	4.3	3.4	2.8	3.2	19.5	20.7
Cultivators	24.4	16.5	14.2	13.0	71.4	57.5
Grain combines	5.8	5.8	5.5	5.5	6.1	7.3
Growth rates of the main types of agricultural machinery park						
Tractors	-5.6%	-6.0%	-4.8%	-5.5%	-4.4%	-3.0%
Ploughs	-6.8%	-6.4%	-5.0%	-5.5%	-3.9%	-3.1%
Cultivators	-4.7%	-6.0%	-4.3%	-4.7%	-3.1%	-3.0%
Seeders	-6.6%	-6.8%	-6.3%	-7.1%	-6.2%	-5.7%
Grain combines	-5.6%	-6.1%	-4.9%	-5.0%	-3.4%	-2.9%
Growth rates of production of the main types of agricultural machinery						
Tractors	-5.3%	-39.2%	-11.8%	-23.9%	25.5%	12.5%
Ploughs	-37.7%	-20.9%	-17.6%	14.3%	509%	6.2%
Cultivators	-15.3%	-32.4%	-13.9%	-8.5%	449%	-19.5%
Grain combines	-10.8%	0.0%	-5.2%	0.0%	10.9%	19.7%

Source: Federal State Statistics Service of Russia, http://www.gks.ru/[14].

The growth rates of the park of agricultural machinery and productivity in the analyzed period were also compared (Fig. 3).

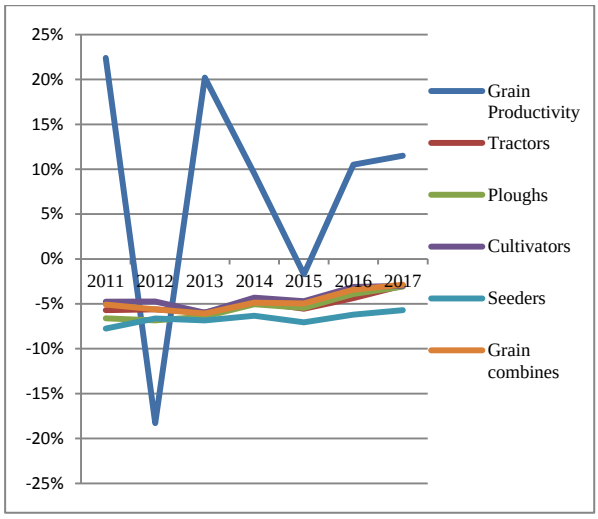

Fig. 3. Growth rates of agricultural machinery park and grain productivity in the Russian Federation, % (2010 – 2017)

Source: Federal State Statistics Service of Russia, http://www.gks.ru/[14].

The results of the data analysis makes it possible to conclude that the change in the degree of technique availability in the short and medium term does not affect the rise in the intensity of agricultural production. It is vital to search for new factors that increase the level of domestic grain production. The basis for achieving results in the studied field of activity is innovative activity aimed at improving the efficacy and intensification of national grain production. The rise in the fleet of agricultural machines and the quantity of fertilizers in the near future will not affect the improvement of the parameters of grain subcomplex functioning. In this case, can only increase the mineralization of soils and deteriorate the quality of products. The main driver of growth is innovation and know-how aimed at finding new (including hidden) reserves of productivity growth and production efficiency.

CONCLUSIONS

Areas of innovative development should first focus on priorities that can be ranked according to the planning horizon. In the operational perspective (1-3 years) it is necessary to carry out approbation works on adaptation of the best practices in the sphere of grain crops production, storage and processing. In the operational perspective, it is also necessary to determine the promising areas of domestic research and development for the strategic perspective.

The strategic plans (5 years) should focus on genetic research, which should take into account climate change and the characteristics of the new agricultural zoning. In this context, scientific investigation in the sphere of efficacy wheat production provision in the terms of water scarcity and the need for its effective use are also becoming relevant. It is vital to direct financial and scientific efforts to address the issues of effective technical equipment of modern grain production. Agricultural engineering should give answers on these questions.

A perspective topic for further research is the direction of development on integration processes in the Post-Soviet market of grain producers. The formation of Eurasian region producers cartel of such participants as Russia, Ukraine, Belarus, Kazakhstan and partners from Eastern Europe opens up opportunities to strengthen their market positions. Balancing supply and demand, as well as the qualitative characteristics of the products can be a significant argument in trade wars, which have become commonplace.

The global globalization project is coming to an end. The chain of global production and consumption is collapsing. Foreign trade sanctions and artificial barriers form the need for the creation of new business clusters. All this is taking place in conditions of the beginning of the world food crisis. The world population is growing faster than the productive forces. Food shortages are increasing. The grain ceases to be a largely forage crop. Quality grain is becoming scarce in the food market. At the same time, drinking water becomes a scarce resource, access to which is absent for many inhabitants of our planet. It should also be noted in mind that a number of countries – the world's energy producers - are net food importers. The effective demand in the world for food grain is only growing. Note also China, which plays a significant role in global grain purchases.

At the same time, only innovations have the potential to significantly increase the yield

and consumer quality properties of grain subcomplex products. The results of research and development should be replicated and put into management practice of the majority of Russian agricultural producers. The efficiency and quality of production processes are the main conditions for increasing the investment attractiveness of the industry and, accordingly, the formation of a resource base for financing innovative developments.

Public-private partnership and national planning should be harmonized with the research and education policy. The solution of all the above issues will significantly improve the performance of Russian agriculture.

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THE CONSERVATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE: CONSUMERS' PERSPECTIVES ANALYSIS IN SIBIU AGRI-FOOD MARKETS

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Abstract

To understand the agri-food marketing landscape, in terms of associated factors influencing the future development from the local level it is essential among others to evaluate consumers as customers of agri-food markets. It is relevant to understand their choices on what values are based on and why they became customers of agri-food markets in Sibiu city. This is only one relevant end part of the food chain aside industry and hospitality areas. Their daily philosophy of ensuring agri-food products can support in the end the cost-efficient conservation and sustainable use of genetic resources for food and agriculture required for long-term maintenance food security. The scope of this article is to evaluate the orientation of Sibiu's consumers as customers of agri-food markets in order to understand if they are or not aware about the value of local food. These results may further support the development of public policies related to gastronomic tourism based on local products. The analysis of these results is proving that the customers of agri-food markets are aware about the value of local food and they are mostly oriented to buy them directly from producers, bypassing agri-food markets. The need to develop an appropriate infrastructure dedicated to the preservation of agri-food products appear to be one of the major barriers against trading local products, a major gap in the support of rural area development.

Key words**:** *consumers, agri-food markets, producers, plant genetic resources for food and agriculture, landraces, local breeds, biodiversity conservation*

INTRODUCTION

We live in a fast-changing world, news being present all the time in our real life, attractive but sufficiently disturbing towards an uncertain future [14]. Climate change and economic policies are real today's challenges for long-term sustainable development and, implicitly food security up to global level [17; 24]. Under such circumstances local policies needs new tools and instruments to adopt and adapt for ensuring natural resources access for future generations [8; 20]. Sibiu County has an exceptional natural heritage with a coverage of approximately 52% of protected areas, many of which includes rural communities [1; 21]. Developing a highly performant farming depends not only on the application of intelligent agricultural practices, but heavily on the maintenance of natural resources including soil fertility [11]. Such a goal can be attended by the appropriate access of genetic resources such as plant varieties and hybrids, animal breeds according to natural and semi-natural environmental conditions [5]. The appropriate access to genetic resources can be developed based on procedures that can be initiated at the local level through decision-making factors represented by municipalities from local up to county levels [23]. Thus, accessing genetic resources becomes part of a larger economic landscape. Moreover, to apply the principles of sustainable development in the context of the Brundtland Report (1987) as a Member State of the European Union, it is necessary to strike the balance between the three domains: environmental, socio-cultural and economic for ensuring future generations the access to the same resources for more than 30 years [3]. The ease way of passing into the current official political documents from socio-cultural to socio-economic issues make us to bring to light a forgotten connection

between culture and agriculture in Europe. To define the cultural dimension of agricultural activities, a special attention should be paid to genetic patrimony of landscapes in Sibiu County. Here we discovered a unique universe of people dedicated to saving seeds from generation to generation, lovers of old animal breeds, who also consume wild food resources or simply lovers of nature itself [1]. Ensuring the sustainable access to these genetic resources will become a milestone that should be relevant for a county public policy supporting the title of European Gastronomy Region Sibiu in 2019 [18; 19]. The local taste, specific to gastronomic tourism [4; 10; 12; 15], is mainly imprinted with food genetic resources (i.e. edible plants, animals and mushrooms), followed by the access of unpolluted soil, the care for natural health and nature itself and the support of circular economy [7]. The scope of this article is to evaluate the awareness of consumers in agri-food markets of Sibiu city in Romania, regarding the origin of some major local products specific for Sibiu county such as:vegetables, fruits and raw-materials. We consider that the results of this survey are relevant for further supporting public policy developments required for a circular economy where the agricultural management as a whole can profoundly be changed. Furthermore, the official recognition of local genetic resources will support long-term food security maintenance for rural communities that can be further replicated into the European context [1; 13].

MATERIALS AND METHODS

Survey method. 200 respondents as consumers and sellers, randomly selected into three agri-food markets have been investigated for the origin of some major food raw materials such as: cheeses (i.e. Sibiu cheese, bell cheese, curd and urda), vegetables (i.e. potato, beans, cabbage, onion, garlic, parsley, dill, tarragon, thyme and basil), fruits (i.e. apple and plum fruits) and raw materials (wheat flour). The series of agri-food items were selected based on the county ability to provide such products in close cooperation with the county Directorate for Agriculture and Rural Development. The questionnaires were anonymous, full accepted by all respondents and applied during September 2017 and 2018.

Places of investigations. Three agri-food markets from Sibiu city were investigated such as: "Cibin", "Transilvania" and "Huet" (Fig.1). "Cibin" market is a constant open agri-food market, "Transilvania" and "Huet" are open all year around during Saturday and it is open only to local producers and householders from rural areas of Sibiu county [22].

Data analysis All data provided during the survey have been statistically analysed.

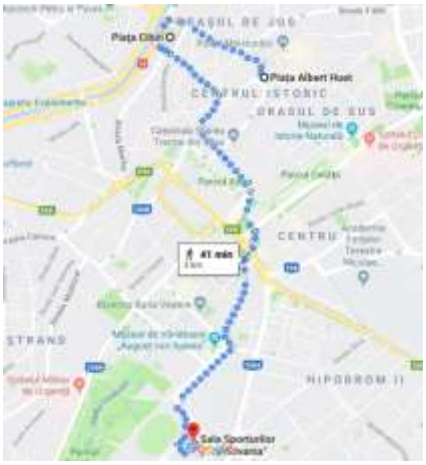

Fig. 1. The main agri-food markets investigated for consumers options regarding the origin of agri-food products in Sibiu city: Transilvania, Cibin and Huet markets.
Source: Modified map after www.google.com/maps.

RESULTS AND DISCUSSIONS

The analysis of Sibiu's customers from agri-food markets. Based on the survey's results, more than 66% of the consumers from Sibiu city, buy products from agri-food markets, and this can be considered as a positive attribute for future steps under Sibiu European Region of Gastronomy 2019 (Fig. 2). However, there is not evaluated the public that is highly dependent of hypermarkets, but only on the public from these three agri-food markets.

The analysis of cheese originating from Sibiu county. Cheeses of all kinds are produced in Sibiu county (i.e. Sibiu cheese,

bell cheese, curd and urda) [22]. They are purchased from the agri-food market at only 1% (i.e. from Cibin market), since most of the respondents (74%) declared that they buy it directly from Sibiu county's producers (Fig. 3). This result may be considered as a vulnerability for the agri-food market development as a monitoring system for local chees marketing is not possible yet to be implemented.

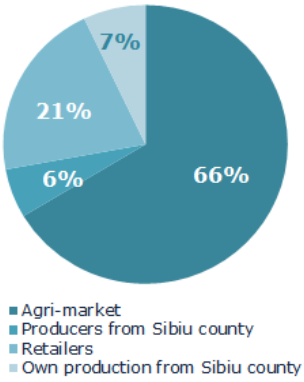

Fig. 2. 66% of customers are ensuring their products from agri-food markets of Sibiu.
Source: Original data.

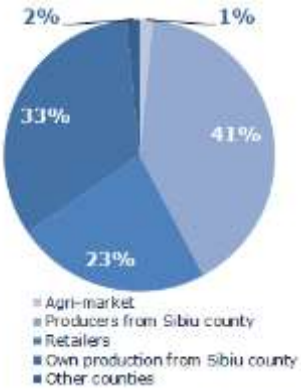

Fig. 3. The origin of cheeses in Cibin agri-market. 41% of the customers are ensuring their products directly from producers of Sibiu county.
Source: Original data.

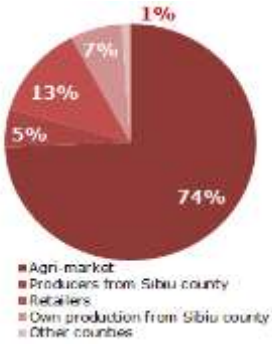

Fig. 4. The origin of potatoes for consumers. 74% of the customers are ensuring their products from agri-food markets of Sibiu county. Source: Original data.

Furthermore, there is no evidences for the closing of the economic loop at the county level [7].

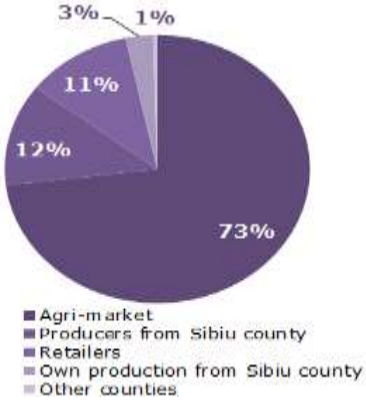

Fig. 5. The origin of beans in Cibin agri-market. 73% of customers are ensuring their products directly from agri-food markets of Sibiu county. 12% are accessing directly the producers.
Source: Original data.

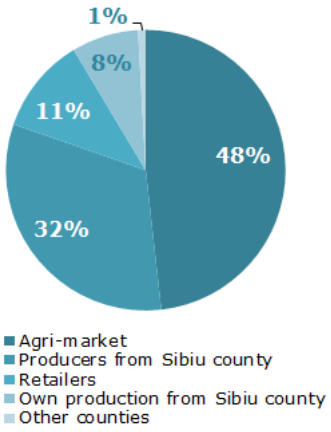

Fig. 6. The origin of cabbage for consumers. 32% of the customers are ensuring their products directly from producers of Sibiu county. Source: Original data.

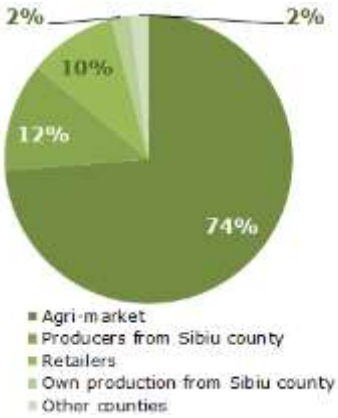

Fig. 7. The origin of green onion and garlic for consumers. 74% of the customers are ensuring their products directly from agri-food markets of Sibiu county.
Source: Original data.

On the other hand, a careful analysis of this result may be a prerequisite for the manifestation of an economic landscape to support the Sibian circular economy [18]. If the central scope of the Sibiu county's policy would be a sustainable economy, these results would support the recommendation that there is a need to deeply analyse the economic landscape by involving all stakeholders of the food chain (i.e. including restaurants and hospitality) [18; 19]. Also, on one hand to maintain this positive attitude of supporting the circular economy and on the other hand to increase the confidence of the Sibiu's consumers regarding quality of cheeses entering the agri-food market [22]. Gains should be geared to both poles of economic interest under this hypothesis and as a consequence it is compulsory to rethink the concept of a sustainable cheese market in Sibiu as well as in Romania.

On the other hand, the situation of sheep breeders is already known by officials [22]. Thus, the traditional Romanian breeds are used by shepherds who know how to grow and breed these valuable genetic resources that today are endangered due to the slow replacement with highly productive breeds of import. However, the local taste, so much claimed by gastronomic tourism [6] may suffer dramatically if there will be recorded losses in terms of traditional old breeds.

In this regard, there exists a traditional knowledge associated with genetic resources (represented by sheep breed, grazing systems, pastures management, connectivity to wilderness and pollinators) that needs to be updated to the today's general negative issues of agricultural development.

Among these it should be mentioned the increasing number of wild (wild boar, *Sus scrofa*) and domestic herbivores (i.e. sheep herds) that are the main vectors, for example, for the transport of potato cysts nematodes or PCNs (*Globodera pallida* and *G. rostochiensis*). "Sheep transfer to pastures" should be regulated at the county level to ban the use of arable land.

We mention that Sibiu county, as the whole country, is under phytosanitary quarantine since 2007 for the above-mentioned problems, which is why the seed potato market was lost for export. Moreover, the PCNs resist into the Romanian soils up to 28 years compared to other EU countries where they can resist up to 8 years (i.e. the official period recognized by the EU specific regulation today).

Under these circumstances veterinary authorities apply extremely expensive but inappropriate measures from where the inefficiency of their application into the Romania pedoclimatic conditions. In order to solve out this situation it is necessary to involve all stakeholders to ensure the declaration of *free zones* of phytosanitary quarantine in Sibiu where the transfer of sheep herds should be forbidden. This concept is defined at the level of the EU and would ensure the revival of the county economy and the long-term sustainability of the cheese market on the one hand and other agri-food products dependent on the sheep management on the other hand. Sibiu may return to the market for the production of seed potato free from pathogens of phytosanitary quarantine by the proper integration of phytosanitary and sanitary veterinary measures in all agricultural activities [2].

The analysis of vegetables originating from Sibiu county

Potatoes (*Solanum tuberosum*) have been slowly entered the Sibiu market since the eighteenth century, alike all Transylvania, and have since become a basic food source [9]. Currently, potato trade outside the EU is banned for Romania due to the barriers imposed by the phytosanitary quarantine mentioned above.

Based on the survey results white potatoes varieties are the most frequent traded on the market (i.e. 95.33%), with 74% purchasing from the agri-food markets and 12% directly from the county's producers (Fig. 4).

The relatively low rate of penetration into the agri-food city-market of potatoes is due to the lack of connectivity between producers, transport, storage and city-marketing. We may add the lack of a financial mechanism for the equitable distribution of the benefits sharing

resulting from the sale of local goods for small producers and farmers.

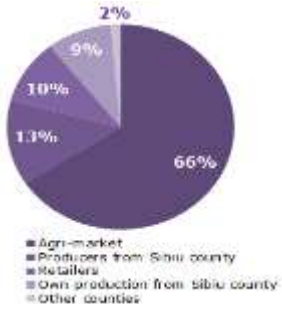

Fig. 8. The origin of dry onion for consumers. 13% of the customers are ensuring their products directly from producers of Sibiu county. Source: Original data.

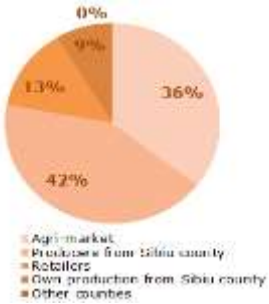

Fig. 9. The origin of dry garlic for consumers. 42% of the customers are ensuring their products directly from producers of Sibiu county. Source: Original data.

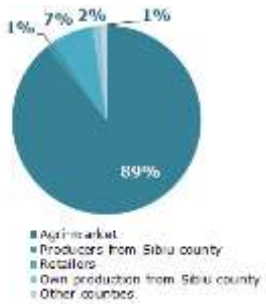

Fig. 10. The origin of green vegetables for consumers. 89% of the customers are ensuring their products directly from producers of Sibiu county.
Source: Original data.

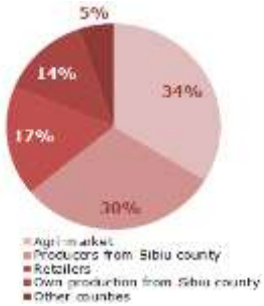

Fig.3. The origin of apple fruits for consumers. 30% of the customers are ensuring their products directly from producers of Sibiu county.
Source: Original data.

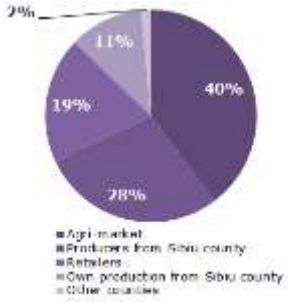

Fig. 4. The origin of plums for consumers. 28% of the customers are ensuring their products directly from producers of Sibiu county.
Source: Original data.

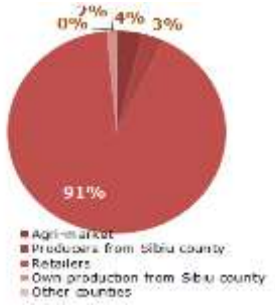

Fig. 5. The origin of wheat flour for consumers. 91% of the customers are ensuring their products from retailers of Sibiu county. Source: Original data.

We mention that in Sibiu County, are still white local potato varieties in hilly areas, preserved, for example, by householders from Răşinari. These genetic resources can become a subject of interest to the Sibian gastronomy, restaurants and hospitality due to the uniqueness of composition and taste [16; 18].

Beans (*Phaseolus* sp.) have a similar history with potato, being one of the most popular crops for pods and grains, being consumed almost all year round.

The analysis of the results of the interviews shows a situation comparable with that of potatoes, namely 73% of consumers buy from the agri-food markets and 15% directly from the producers (Fig. 5).

A series of missions in the rural area of Sibiu conducted by us showed that old bean varieties of an amazing diversity are currently preserved in the rural householders [1]. They represent primary genetic resources for their living for all 365 days in a year. But they also represent secondary genetic resources for accessing the economic landscape alike.

Cabbage (*Brassica oleracea* L.) is one of the oldest genetic resource in this area [9]. The

historical attachment of locals to cabbage can be found in syntagma such as: *Meșindorf's cabbage* or *Moșna's cabbage*, *Cabbage of Rothberg* or *Roșia's cabbage*, *Kastenholz's cabbage* or *Cașolț's cabbage*. In the county of Sibiu, the favourable pedoclimatic conditions triggered during time the cultivation of the cabbage to cover both own needs and marketing [1]. Consumption in crude status, boiled, cooked or as a pickled is a *long-time* tradition, becoming an integral part of traditional gourmet culture. Generally, its high nutritional value is internationally recognized in case of organic cabbage (non-pesticide-based). In Burgberg or Vurpăr it is possible to buy bio-cabbage. At present, seeds of local varieties of cabbage seems to still exist in certain householders and family farms. However, these original seeds, should be proved for their uniqueness as genetic resources through genetic markers. The dramatic loss of local seeds may be due, on one hand, to the certified seeds promotion from the global market and on the other hand to the two years life cycle specific to the cultivation technology. This two-years life cycle, in an era of speed, generally led the locals to directly access the seeds from the large market and lose the practice of producing it by their own [1].

However, for ensuring long term food security the side effect of this unfair promotion is the erosion of traditional knowledge related to the production of a full life cycle cabbage seeds into households. Such a loss is more than dramatic as we have to deal with a cultivated resource for over 2,000 years and stimulating the maintenance and recovery of local memory should be vital in poor rural areas. Thus, the cultivation of cabbage seeds/seedlings should be encouraged, and households, small farmers or dedicated farmers/householders need promotion at the level of Sibiu and the county level in particular, under the umbrella of the concept of food security for local communities in Sibiu County. Cabbage is also a crop plant threatened by phytosanitary quarantine pathogens. Agricultural specific cultivation measures, and arable land management being complex, will require new guidelines under the umbrella of food security. White cabbage in particular is purchased from the market at 48% shares, as 32% of respondents buy directly from producers or 8% from villages in Sibiu County from a total of 40% (Fig. 6). It is noteworthy that although there are villages with long history and traditions in the cultivation of the cabbage, however the circular economy does not work.

Onion and garlic (*Allium cepa* L. and *A. sativa* L.) Green and dry onions and green and dry garlic are indispensable in the Sibian cuisine, with a history of their use of over 2000 years [9].

Green onions and garlic are provided in a ratio of 74% of the market and 14% from producers in the limits of Sibiu County (Fig. 7). Dry onion bulbs for consumption are also provided in a ratio of 66% of the market and 22% of the limits of Sibiu County (Fig. 8). Dry garlic is not highly sought after in the market (36%), 51% of which is covered within the limits of Sibiu County (Fig. 9).

There is a clear concern to maintain local populations of onions and/or garlic in villages of Sibiu. These genetic resources are mixed as origin between native and imported and not well established. However, in every village of the county we encountered dedicated householders for old varieties preservation [1].

Green vegetables 5 species of interest were surveyed such as the following: parsley (*Petroselinum crispum* (Mill.) A.W.Hill), dill (*Anethum graveolens* L.), tarragon (*Artemisia dracunculus* L.), thyme (*Thymus vulgaris* L.) and basil (*Ocimum basilicum* L.). All of them are constantly present on the city food-market and are ensured for the consumers at 89% of their needs. However only 3% are supplied directly from producers in Sibiu County or hypermarkets (Fig. 10).

The analysis of fruits originating from Sibiu county. Fruit trees are traditionally cultivated for over 5,000 years (i.e. plum three, cherry three, sour-cherry three and walnut three) [9]. The apple trees and the pair trees reached the old Dacia, at the same time with the Roman Empire and since than they

were very well integrated into existing agro-ecosystems. The apple tree is traditionally cultivated in Sibiu County for over 2,000 years and in an organized system for several centuries. Basically, these genetic resources are older than 2,000 years for their presence and essential for pollinators [22]. Old varieties obtained some four of five centuries ago in their countries of origin (i.e. Germany, Austria, England, France), entered Sibiu County for more than 350 years ago. The pattern of traditional orchard in Sibiu County is of German and / or Austrian origin: cultivation in large rows (i.e. distances of 10 m between three rows) allowing the exploitation of the meadow differently for the cold and warm seasons. This type of multi-covering land use management has supported the rural communities in Sălişte, Cisnădioara and Valea Târnavelor to exploit cost-efficient and sustainable agricultural resources for more than 800 years with the establishment of the first Saxons in Transylvania.

Sibiu's apple fruits are bought from the market in 34% of the Sibiu County and 44% directly from the producers (Fig. 11).

Plums are insured from the market in 40% and for sure from Sibiu County 39% directly from the producers (Fig. 12).

The lack of connectivity between the fruits producers and the food market, including the lack of storage houses are among the major problems for ensuring the functioning of circular economy.

Moreover, we need to underline that there are householders, in all villages in Sibiu that applies traditional grafting methods. This is a valuable traditional knowledge that should be exploited for the future development strategies of the county.

The analysis of food-raw materials originating from Sibiu county

Wheat flour is the most representative food resource, being ensured in the largest proportion of food chain stores, of uncertain origin, only 5% of consumers are buying directly from producers in Sibiu County (Fig. 13). There is a serious lack of interest in ensuring financial mechanisms for rewarding local producers for this asset.

CONCLUSIONS

By analysing the customer preferences related to the origin of agri-food products it is possible to envisage the real situation of rural economy in the neighbouring localities. Furthermore, it is possible to set new public policies that can support rural areas development. The major lack in the current economy is the agri-food storage chain that can further supply agri-food markets for Sibiu county or in the country. The integrated management of livestock and crops is essential for the appropriate implementation of the phytosanitary and veterinary measures of quarantine importance. This analysis provides the first evidences that local genetic resources for food and agriculture are still marketed in Sibiu agri-food markets. Moreover, there is a need for awareness among customers regarding the positive effect on the circular economy of their choice when are buying agri-food products from the markets.

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THE CONSERVATION OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE: SELLERS' PERSPECTIVES ANALYSIS FROM SIBIU'S AGRI-FOOD MARKETS

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Abstract

Agri-food markets are among the major pillars relevant for selling agri-food products. However, food industry and hospitality are among the major stakeholders in the food – chain economy. The connectivity between producers, sellers and consumers such as customers of agri-food markets, retailers, food industry and hospitality are relevant for assessing the future implementation of a feasible strategy regarding the rural sustainable development including the conservation of genetic resources for food and agriculture. Sibiu county is awarded for 2019 as a European Region of Gastronomy and therefore a major attention should be paid to city agri-food markets that should be oriented to local products selling. Sellers are among the relevant stakeholders to provide valuable information regarding the food-chain. The scope of this article is to assess the sellers from the largest agri-food market of Sibiu city: "Cibin" market. Based on this analysis, native products from Sibiu are replaced with similar products from different counties or from import to a share up to 5% even during the harvesting season. However, there is optimism in developing the preservation conditions for more perishable agri-food products that may further improve the selling of local products and as a consequence the maintenance of local resources. Thus, by developing preservation conditions for agri-food products will fuel the appropriate conservation measures implementation of plant genetic resources for food and agriculture in a most cost-efficient way.

Key words**:** *sellers, agri-food products, plant genetic resources for food and agriculture, landraces, local breeds, biodiversity conservation*

INTRODUCTION

Once Sibiu city, from Romania, was awarded with the title Sibiu European Region of Gastronomy for 2019 it is relevant to evaluate the success of the entire agri-food chain functioning for culinary tourism [16]. The culinary tourism starts in local communities that are providing unique local taste and applies the sustainable development principles for their future [14]. However, the circular economy should function in these areas throughout the involvement of stakeholders interested in the quality of local agri-food products. Among these, customers of agri-food markets from large cities or the hospitality industry, food processing industry are of interest to be attracted to add economic value to the food chain [10]. Such analysis is not very often in Romania, but the current award raise attention among the local and county stakeholders regarding the success of circular economy in Sibiu city and county [1; 17]. Thus, aside local producers an important subject for analysis are the agri-food markets from cities [8]. In this case, sellers and customers are among the major stakeholders that can be accessed to provide the best information is needed to substantiate the best developing strategies for rural development. The scope of this article is to analyse sellers from three agri-food markets of Sibiu city regarding the success in selling local products. Gaps and needs identification in this regard is essential to connect them with future strategies for rural development in a bottom-up approach for ensuring the conservation and sustainable use of agro-biodiversity in rural areas.

MATERIALS AND METHODS

Survey method. 120 respondents as sellers, randomly selected in the Cibin market of Sibiu have been questioned for some agri-food products such as: vegetables, fruits, cheeses and raw materials for food (i.e. wheat flour).

Only native origin vegetables (i.e. basil, beans, cabbage, dill, garlic, onion, parsley, potato, parsley, tarragon and thyme) and fruits (i.e. apple fruits and plum fruits) were the subject of the survey. These questionnaires were fully accepted by respondents and applied during September 2017 and 2018.

Places of investigations. Agri-food market *Cibin* that is placed at the foot of the old city on the left bank of Cibin river [Fig. 1]. It is open all year around and it is famous for vegetables, fruits and cheeses. Also, there is possible to buy bread, meat and other merchandises [17].

Data analysis Provided data during the survey have been statistically analysed.

Fig. 2 The Cibin market is the oldest and most important agri-food market in Sibiu City.
Source: Modified map after www.google.com/maps.

RESULTS AND DISCUSSIONS

The origin of food products. In "Cibin" market, 43% of sellers, are placing on the market products that are native from Sibiu County, that is less than half of the entire traded merchandise. However, it can be considered that it is a good result for further developing the circular economy. The rest of agri-food products have different origins either are originating from neighbouring or remote counties either from import. We investigated only potential native agri-food products already mentioned above. Based on the sellers' statements, they are selling products originating from 11 counties in Sibiu. Moreover, 12% of sellers themselves are originating from the neighbouring Vâlcea County and 26% are from the more remote county of Olt. In this regard, the financial benefits of agri-food markets of Sibiu also attracted sellers from other counties. However, it is relevant to underline that 5% of the merchandise place on the market is imported, even the investigated products should be native in September, the harvesting season (Fig. 2). We consider that such a share represents a threat for local rural economy [20]. This is also due to customers behaviour that is fuelling imported products infusion on the markets. However, this is negatively impacting the rural development activities in the county and region and it is a major threat for maintaining native products such as landraces and local breed in agri-food business. A major role in this will have the customer's information, awareness and education. Also, it is relevant to support local public policies development that should further support local micro-economy [11]. The diversity of products origin in the Cibin agri-food market supports the idea of the consumer interested in the appearance of commodity (i.e. colour, shape, cleanness), and the price (i.e. lowest price), no matter where they come from. On one hand, the share of less than 50% of the products marketed in Sibiu County shows that, although there exists potential at the county level to support circular economy. However, based on sellers' opinion it is necessary to support the Sibiu's producers to integrate them into the commercial market by implementing those financial mechanisms of equitable distribution of benefits [5].

Such a functional mechanism can remove or slow-down the infusions of imported products at least during the harvesting season of native agri-food products. It can be considered that it is a real success the Saturday's Markets of

"Huet" and "Transilvania" where only local producers from Sibiu county and neighbouring counties are accepted to participate, by raising the awareness of the value of local agri-food products.

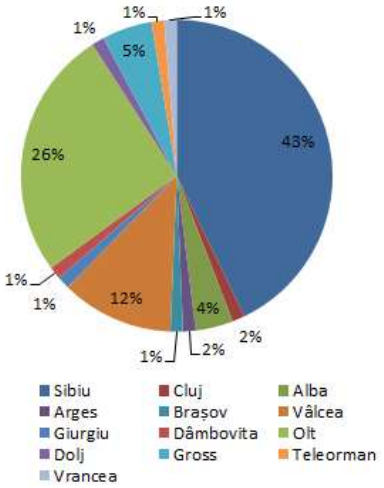

Fig. 2. The place of origin for agri-food products in Cibin market. It can be seen that 43% of the agri-food products are from Sibiu county and 5% are of import origin from the gross market. The rest are of eleven county origins.
Source: Original data.

The opening of these markets belongs to the vision of the mayor of Sibiu, that started with 2007, when Sibiu was awarded with the title of European Capital of Culture [13]. This can be considered already as a good practice for educating city's consumers regarding values and quality of local products, local taste and the benefits of supporting local economy [4].

Best-sold local agri-food products in Sibiu. According to sellers, among all types of products, certain vegetables and fruits are the best-sold and have been the subject for further developing questionnaires for consumers upon a former unpublished study realized in 2016 and 2017 (i.e. potatoes, tomatoes, cabbage, peppers, eggplants, herbs) (Fig. 3). Usually, unperishable vegetables and fruits are the best sold. One inconvenience is the lack of cooling storage places in case of perishable vegetables and fruits, that even they are produced in the region however, they cannot compete with those that are imported.

Sellers opinion regarding the future of original products from Sibiu county. The long-standing experience of sellers is essential to make considerations about the real projection and development of any market strategy in this area. That is why we consider the answers of sellers in "Cibin" agri-food market to be relevant [6].

Fig. 3. The best agri-food products sold in Cibin market. Tomatoes, cabbage, potatoes, pepper and cucumbers are among the best sold vegetables.
Source: Image generated at: https://www.jasondavies.com/wordcloud/.
Original data.

A share of 49% of respondents believe that it would be possible to increase trading which would support further the implementation of the Programme supporting the award European Region of Gastronomy for 2019 (Fig. 4).

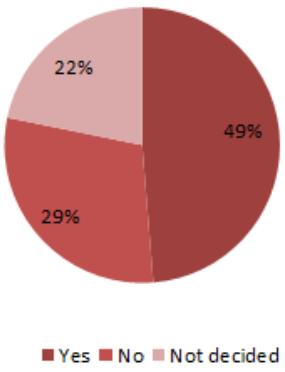

Fig. 4. 49% of sellers considered that there is still a potential for increasing sales into the Cibin market.
Source: Original data.

They are taking into consideration their personal experience related to improvements' history of agri-food markets during the past

ten years. However, they are not very optimistic due to the imports and the lack of storage-houses for vegetables, mainly highly perishable in the region. Based on their opinion the life-time of vegetables from Sibiu county or neighbouring counties is shorter because of the lack of interest of developers to invest in agri-food business of local origin, a situation similar with others reported already [12]. Among the major stakeholders have been mentioned county's and local authorities that have no interest or financial support to develop equitable incentive measures that might attract investors in this business.

All respondents claimed that storage conditions for vegetables should be improved and especially selling conditions during summer and winter seasons. They complained about the lack of storage conditions during the nights and weekends as well as the lack of protection against the canicular or frosty and windy days inside the agri-food markets. Based on their opinion also customers are not visiting the markets during these days.

Fig. 5. The most frequently mentioned products not very well sold in the Cibin market during the season are cauliflower and potatoes from Sibiu county. Image from: ttps://www.jasondavies.com/wordcloud/.
Source: Original data.

The hardest agri-food products for selling. Consumers' education on agri-food products can also be analysed from the perspective of sellers by linking consumers' data to agri-food product categories [19]. In other words, according to the sellers, more perishable products are much economic loss are. These products require particular preservation conditions, and this is the reason why customers are avoiding buying them even if they are part of the Bio category. Thus, cauliflower is preferred to be bought from large retailers (i.e. import for different countries) to the detriment of agri-food markets where a suitable climate conditions cannot be provided to prevent browning. This situation was already signalled by other authors in other countries [7]. In addition, responses become relevant if they associate with the origin of the sellers (e.g. the leek is marketed by southern producers from Vâlcea, Olt) the general appearance of vegetables and fruits (i.e. cauliflower and quince) as well as the competition (i.e. potatoes sold from other counties or even from other countries such as Turkey during early spring time). Leeks are not very well sold into the agri-food market according to the sellers and wilting is the major threat for sellers (Fig. 5).

Cheese selling for all year around. To ensure the sustainable selling of agri-food products during one year duration it is relevant to consider the potential success of primary food products on the market [3]. Such an approach will further support the continuous use of traditional genetic resources inside agro-ecosystems as well as will maintain the traditional knowledge related to the genetic resources for use, processing and selling. In Sibiu it was recognized the brand "Sibiu's cheese" due to the traditional knowledge related to the seeps breed as well as cheese production under specific conditions [1]. Therefore, cheese can be considered as a valuable food resource regarding its use and selling all over the year.

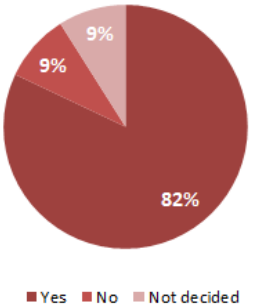

Fig. 6. Sellers opinion on the potential selling of cheeses all year. 82% of the sellers considered that it is possible to develop the market for selling cheeses al around year.
Source: Original data.

On the other hand, sellers may have a positive impact in changing consumer perceptions and may provide a fairly realistic picture of their philosophy generally for trade.

Thus, cheeses could be marketed constantly throughout the year at higher levels in the opinion of 82% of cheese sellers (Fig. 6). However, there are gaps according to the sellers that are originating from the need to improve selling conditions into the market' places.

The vision of sellers related to the future of agri-food market in Sibiu. Perhaps the most difficult question is about the opinion of sellers regarding the future of agri-food market in Sibiu city. Almost all of them have a long-standing family experience in marketing agricultural products. Despite all difficulties (i.e. the lack of storage-houses, the lack of shelters during the canicular, heavy raining or frosty days) over half of the respondents were optimistic (Fig. 7). They took into account the continuous improvement of the conditions in "Cibin" agri-food market as well as the development of "Tranilvania" and "Huet" market's places. Also, the recent branding of local food staff contributed to the increase of their visibility as well as their own income.

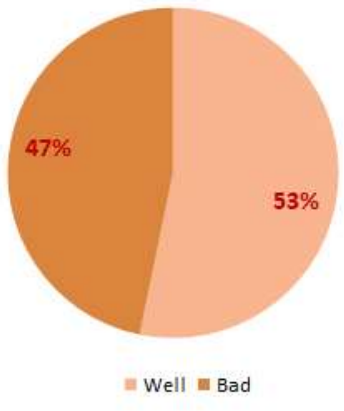

Fig. 7. More than 53% of the sellers considered the potential increase for cheeses sales into the market.
Source: Original data.

Data regarding sellers. 58% of the sellers are content with their job and 55% are optimistic for the general increasing of agri-food products selling in "Cibin" market. 54% of respondents were women. Regarding their age: 30% of respondents were between 30 and 45 years old and 34% between 46-55 years old. Regarding their social status, 70% of respondents were married, 13% divorced, 10% unmarried % and 7% widows.

CONCLUSIONS

Agri-food markets are among the major food-supply in Sibiu city in the same manner like in other cases [15]. The sellers are mostly selling unperishable fruits and vegetables, a similar situation with the Netherlands and United Kingdoms [18]. On contrary perishable fruits and vegetables are of import origin due to the lack of refrigeration conditions and additional high costs [2]. Thus, under these circumstances, local agri-food products of Sibiu county origin are replaced by those of import. The selling conditions are claimed that need to be improved if local products should be supported for their entering the city agri-food markets. Based on the above conclusions we consider that by supporting the selling conditions in agri-food markets, local products will fully enter the food chain for Sibiu county and may further support local producers from rural areas in a similar way like in other cases [9]. Only closing the loop in the circular economy of rural areas will be possible to think of a real cost-efficient strategy for further supporting the conservation and sustainable use of genetic resources for food and agriculture and the ensuring of food security for the future [1].

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MECHANISM OF INTEGRATION AND COOPERATION IN THE INDUSTRY OF MEAT ANIMAL BREEDING ON THE BASIS OF CLUSTERING

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Abstract

The main objective of the research is to develop an optimal mechanism for integration and cooperation processes based on clustering in the livestock industries of the agro-industrial complex (AIC) of Russia. The materials of the study were the reports of agricultural organizations, statistical data from the regions and the Russian Federation. The main methods used in the study are: statistical, economic, monographic, abstract-logical. As a result of the work, the state of integration and cooperation of enterprises of the agro-industrial complex and the identified main factors constraining the formation of meat and food clusters are analyzed. The organizational-economic mechanism of integration and cooperation processes based on clustering in the meat-food sub-complex of the agro-industrial complex, discretely at the state and private levels, is substantiated. A structural model of the meat and food cluster based on the platform of the protoclusters identified in the agro-industrial complex of the region and the missing enterprises being formed (the Cluster Development Center, the Regional Slaughtering and Procurement Points and the Hybrid Selection Center) is proposed. The introduction of these proposals in the practice of the enterprises of livestock industries by optimizing the processes of commodity circulation creates prerequisites for reducing the added value of meat products.

Key words**:** *integration, cooperation, clusterization, rural economy, mechanism*

INTRODUCTION

The processes of cooperation and integration are an integral part of the dynamic development of the economy, including the agro-industrial complex. This is explained by the fact that when independent participants of distribution channels act individually on the market, they have to independently carry out sales, price, and other policies and plan marketing activities separately at each level. The participants of the integrated and cooperative structure function as a single organism, coordinating their activities in all areas of production, marketing, etc., which eliminates the duplication of functions. This is especially important for the industry whose products (food) are highly perishable and require special conditions of delivery and storage. Accordingly, optimization of the interaction of enterprises plays a significant role. At the same time, the experience of the leading countries of the world shows that the most promising form of organization of interaction between various participants in the production, processing and distribution chain of products are agro-industrial clusters [3]. For this reason, at this stage of development, the main role in solving the tasks of ensuring effective functioning and improving the competitiveness of agricultural enterprises in Russia belongs to the development of an optimal organizational and economic mechanism for integration and cooperation processes based on clustering, including in various branches of animal husbandry, which makes the research topic especially relevant and timely.

At present, cluster policy in Russia is based on a complex of regulatory legal acts. By 2018, clusters were already mentioned in 18,034 various legal and regulatory

documents of Russia and the subjects of the Federation. In addition, since 2012, 72 international documents (treaties, resolutions, agreements, etc.) have been signed, in which clusters are mentioned [2, 9]. By 2013, according to the Ministry of Economic Development of the Russian Federation, 221 cluster projects were registered in 58 out of 83 regions of the country or in 70% of the territories, with 41 (19%) in the AIC [10]. In accordance with the classification of M. Enright (4 types of cluster policy according to the level of state intervention - catalytic, supportive, directive, interventionist [12]), today in Russia, supporting cluster policy is practiced at the federal level - financing the creation of cluster development centers and individual events. However, there is still no document containing the norms and rules of a single institutional and economic mechanism of integration and cooperation processes based on clustering in the AIC.

Theoretical and methodological approaches to solving the problems of development of integration, cooperation and clustering processes in the agro-industrial complex are presented in the works of many world-famous economists, among which V. Albino [1], D. Barkley [6], E.M. Bergman [8], E. Jakobsen [23], M. Porter [19], S. Rosenfeld [21], H. Roepke [20], S. Schwaag-Serger [4], W. Strange [22], and others. In many works, practice of developing clusters in the agro-industrial complex of various, especially developing, countries of the world (Brazil and Chile [15], Vietnam [18], Ghana [5], Indonesia [25], Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan and Uzbekistan [11], Moldova [24], Russia [2, 14], Romania [7], etc.).

At the same time, insufficient attention is paid to the elaboration of issues of interconnected transition from integration and cooperation processes to broad clustering of all spheres of the agroindustrial complex, their development and functioning in the system of a single mechanism at the regional level, organizational and economic features and methods of forming specific elements and objects. The problems of interaction between economic entities of the agro-industrial complex with research, educational and financial-credit institutions remain unresolved. In addition, there is a lack of targeted state regulation of cluster activity on the basis of a single federal mechanism, which forces us to focus on the development of regional projects for their implementation at the sector level.

MATERIALS AND METHODS

In preparing the research, data from the Federal State Statistics Service of the Russian Federation (FSSS), scientific works of Russian and foreign scientists on the cluster topic, materials of research organizations from different countries of the world were used. When studying the theoretical and methodological aspects of the various organizational and economic elements of the development of integration and cooperation processes used monographic and logical methods. Theoretical studies are supported by an analysis of the current state of integration and cooperation in the agro-industrial complex of Russia, based on statistical and economic analysis, as well as by comparing the results of work using the comparative analysis method. The study of practical experience of the enterprises of beef cattle breeding used the methods of sociological research: survey and interviewing. Determining the directions of development and the formation of the mechanism of integration and cooperation processes based on clustering was carried out using abstract logical and design-constructive methods.

RESULTS AND DISCUSSIONS

We have carried out a study of the state of integration and cooperation processes on the example of one of the regions-leaders of agricultural production in Russia - the Saratov region. Enterprises of the livestock industry of the Saratov region play a prominent role in the country's agro-industrial complex and the Volga Federal District of Russia (VFD), which includes 14 regions adjacent to the Volga River. Occupying 15% of the total agricultural area of the Volga Federal District, they contain 8% of the cattle, 19% of sheep

and goats, produce 12% of the total agricultural output of the Volga Federal District (including 8% of milk, 6% of livestock and poultry), and also produce 22% of sausage products.

The results of the study made it possible to determine that in practice the integrated structures of animal husbandry in the Saratov region, depending on the territorial level of integration, can be divided into two main types:

(i)regional - formed by economically strong enterprises within their own or neighboring regions ("Belaya Dolina Group of Companies");

(ii)federal - large interregional companies, often from Moscow and the Moscow region, with a wide geography of investments (Rumfood Group and CoPITANIA).

The group of companies "Belaya Dolina" focuses only on the development of processing and marketing of livestock products. The group includes a meat processing plant and a dairy plant located in one city of the region (with a total annual revenue of $ 50 million), 2 trading houses, and a transport company. The total number of employees of enterprises has about 2,000 people (Fig. 1).

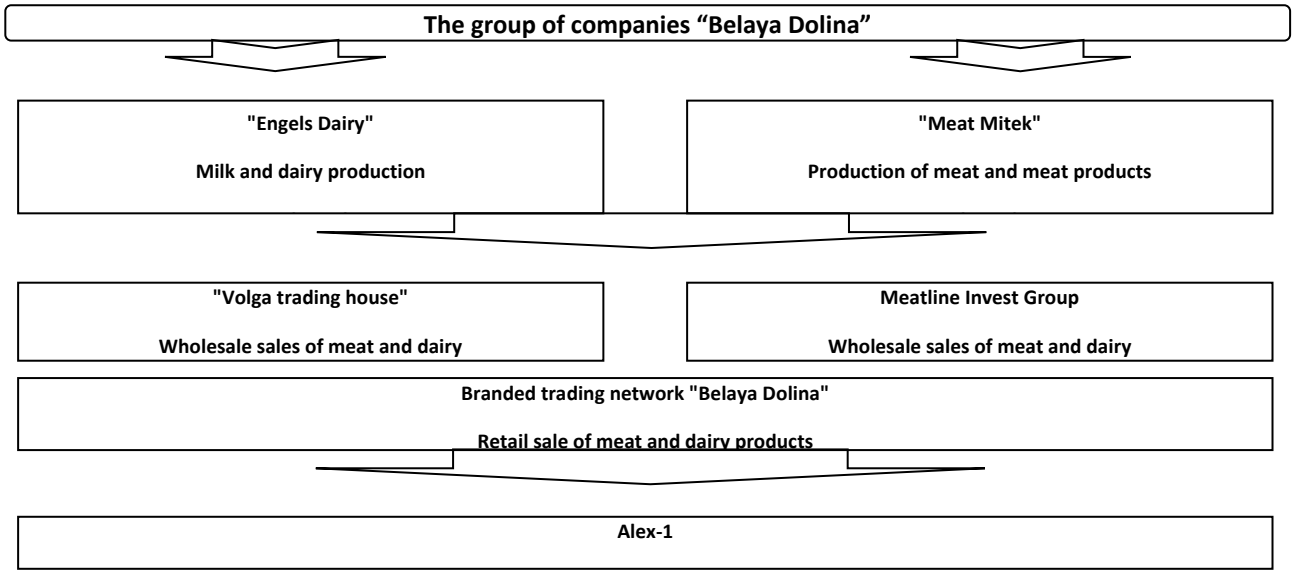

Fig. 1. Organizational structure of the regional agricultural holding "Belaya Dolina Group of Companies"
Source: Compiled by the authors

The Rumfood Group of Companies is a large agricultural holding from the Ramensky District of the Moscow Region (it takes up to 25% of the market for certain types of meat products in several regions of the Central Federal District and the Volga region) in the region is represented by the Ramfood-Povolzhie pig breeding complex. The total cost of the enterprise is 50 million dollars, the design capacity is 150 thousand heads, it includes a feed mill with a capacity of 25 thousand tons per year. Downhole capacity up to 600 heads or 50 tons of meat per day can produce up to $ 16.3 million in revenue per year.

The agricultural holding "CoPITANIA" (units are located in 5 regions of Russia, the total number of employees is 4 thousand people) is represented in the Khvalynskiy Pork Complex. The pig complex consists of 2 divisions in the Khvalynsk and Engels districts of the Saratov region with a total capacity of 65,000 DanBred pigs from Denmark. The pig complex is equipped with modern technological equipment of the Danish company EGEBJERG, which ensures maximum automation of animal housing, annual revenue - $ 15 million.

At the same time, it has been determined that the agricultural cooperation of small farms (peasant (farmer) households, personal subsidiary farms of the population, individual

agricultural entrepreneurs) is well developed in the region, but in recent years it has shown stagnation. In the period from 2001 to 2012 during the implementation of the Priority National Projects and State Programs for the Development of Agriculture, the number of registered and existing cooperatives increased from 28 to 159 and from 22 to 119 units, respectively. From 2013 to 2017 the number of cooperatives decreased in proportion to the reduction of state support. To date, only 16 cooperatives operate, representing only 20.3% of the total (79) registered. Currently, the Ministry of Agriculture of the region has begun to implement grant support for the development of the material and technical base of 8 processing and marketing agricultural consumer cooperatives at the expense of regional and federal funds totaling $ 560.8 thousand. The cooperatives selected as a result of the competition are mainly engaged in procurement and primary meat and milk processing.

At the same time, in order to identify shortcomings in the organization of activities of holdings and cooperatives, we analyzed the structure of the formation of the cost of meat products. As a result of the collection and averaging of data on enterprises of the meat and food subcomplex of Russia, we found a significant preponderance of the total trade margin in the cost of the finished product. This indicates a lack of effective interaction and the lack of agreement between the participants of the protocluster, which allows business entities to overcharge their own products at all stages of the production cycle (Fig. 2).

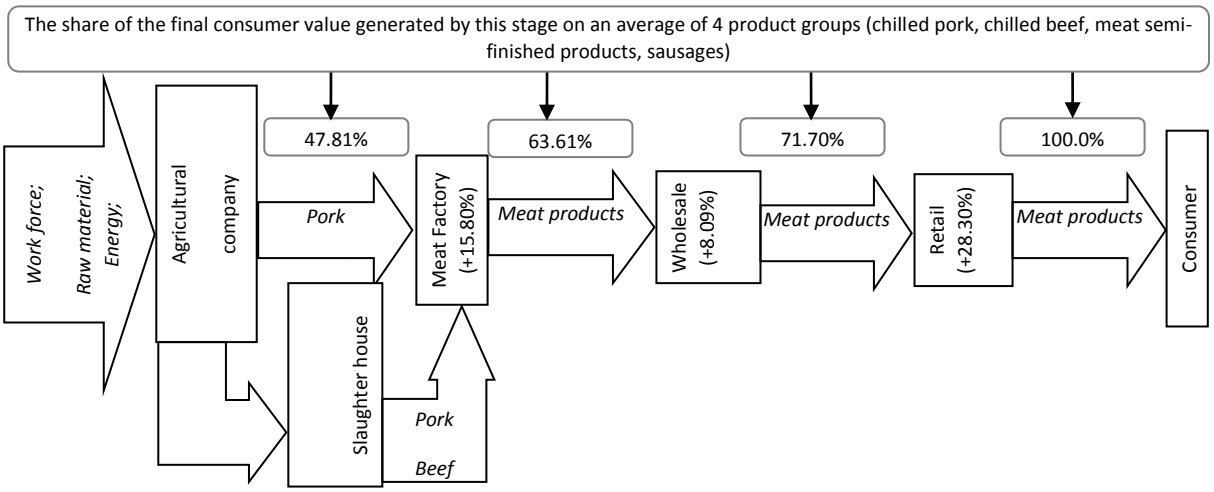

Fig. 2. The existing value-added value chain in the meat product subcomplex of the Saratov region
Source: Calculated by the authors according to their own data and FSSS data.

In the final selling price, the cost of raw materials received by meat processing plants from agricultural enterprises is slightly less than half, the rest is added at the stages of processing, wholesale and retail trade. A significant proportion of agricultural producers is fair but not insufficient, since the largest costs are in raising and feeding cattle.

Thus, in the course of the research it was revealed that there are key enterprises in the region that are developing towards the formation of a cluster. However, regional clusters in the beef cattle industry are in an embryonic, protocluster state [13]. Today, holdings and cooperatives include in their structure significant elements of the cluster production core [10]. But at the same time, there is no interaction with the supplying and servicing satellites of the cluster - scientific and educational institutions, financial and insurance organizations, and technical service enterprises. This does not allow to realize all the existing potential for improving the competitiveness and efficiency of enterprises of the meat and food subcomplex.

For these reasons, it is safe to say that today in the industry of beef cattle there is a need to evolve the protocluster into a full-fledged agro-industrial cluster. The essence of this process lies in the evolution of cooperative

and integrated structures in the cluster of beef cattle (Fig. 3).

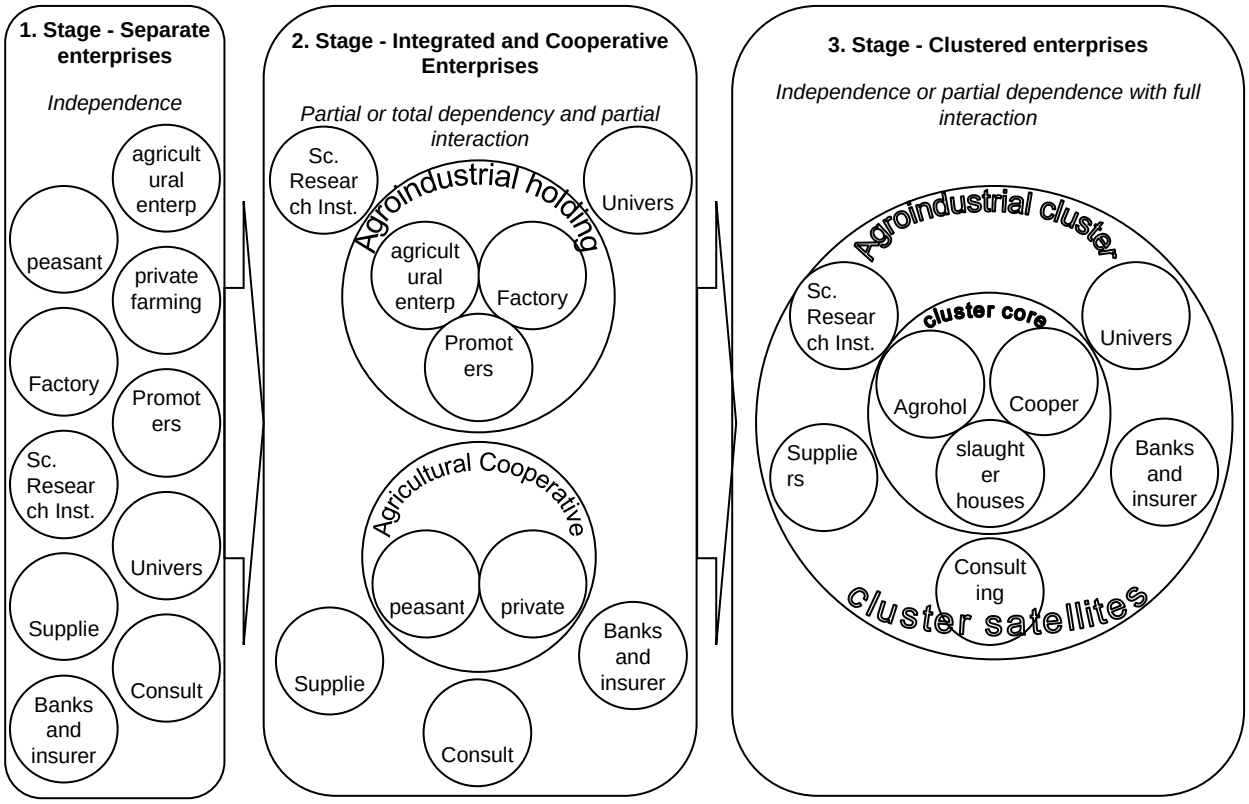

Fig. 3. The three-stage procedure for the development of integration and cooperation of enterprises in the direction of clustering
Source: Compiled by the authors.

In order to support this process, we have formed and substantiated an organizational-economic mechanism, including a phased order of transition from integration and cooperation to the creation of clusters (as a dynamic system) with a functional unit of tasks at the state and private levels (Fig. 4). The mechanism is a structure composed of various forms of organizational (legal, contractual) and financial (cash) elements reflected in the dynamics, that is, in the form of certain processes: integration and cooperation, which constitute the formation of agro-industrial holdings and the integration of the small private farms into agricultural cooperatives [27].

However, despite the significant role of the state in shaping the mechanism of integration and cooperation processes based on clustering, the initiative should come from potential cluster members. Management bodies are encouraged to provide comprehensive support, especially in the initial stages, in the areas of promoting the benefits and designing the cluster.

As a result of the implementation of the proposed mechanism through independent evolution from the protocluster, a full-fledged cluster of beef cattle breeding will appear in the region.

The developed cluster will become a deeply integrated structure focused on expanded reproduction and the implementation of a comprehensive modernization of the existing capacities of the participating enterprises. This will be partly due to the accumulated profit, and partly due to borrowed capital and state support funds [16].

The formed structure of the meat and food cluster takes into account the specifics of the industry, which is expressed in the need to conduct a qualified comprehensive breeding work, increase the genetic potential of animals, and restore livestock on farms (breeding and hybrid centers). It also implies the joint creation by the participants of a sustainable forage base (supplying and servicing satellites) and slaughter and

procuring centers (with the function of primary sanitary and veterinary control and the automated Mercury certification system developed by the Rosselkhoznadzor).

It also implies the achievement of high productivity through the most effective combination of factors of production, free access to information and better coordination of activities (Cluster Development Center). At the same time, the basis of the cluster will be the existing agriholdings with certain characteristics characteristic of the protocluster.

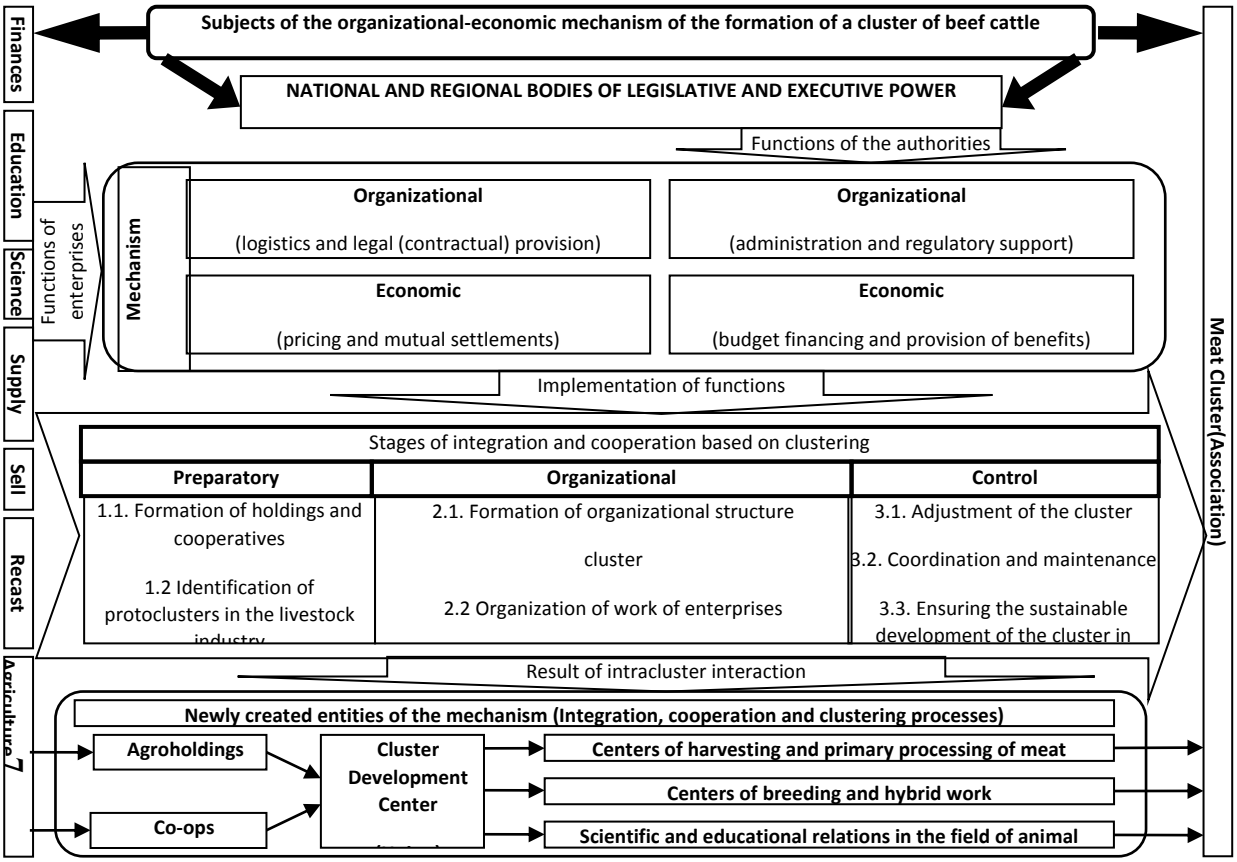

Fig. 4. The organizational and economic mechanism of clustering in beef cattle
Source: Compiled by the authors.

The composition of the participating enterprises and the model structure of the meat and food cluster is formed (Fig. 5).

Building a cluster structure contributes to solving the problem of restoring meat production in small-scale and private farms in the Volga region [17], which is possible today only if they cooperate and integrate with large-scale production, which is characterized by high zoo-sanitary status according to the degree of protection from the introduction and spread of pathogens of especially dangerous diseases (African swine fever, etc.).

Within the cluster, there is a rationalization of the processes of expansion, thinning and modernization of product lines of participating enterprises, anticipating customer demand fluctuations in all markets of presence, acceleration of the process of promoting new products to the market (for example, refrigerated and frozen convenience foods, frozen foods, broths and canned soups).

High-tech development of a regional cluster is achieved through the formation of a joint scientific base of participants, concentration of investments on the most profitable and promising innovative projects, operational accommodation to the transformation of consumer preferences, minimization and distribution of high costs and risks associated with the development and implementation of innovations cluster structure [26].

The logistic scheme we compiled allowed us to compare and analyze the cost structures

using the traditional distribution channel and grain product cluster, demonstrating that in the second case the transaction costs are significantly reduced. In the second case, the number of involved transport units is reduced by 1/4 during transportation from the agricultural enterprise and the procurement center using the same transport, while reducing costs for stockpiling and shipping-loading, and the distributor of the meat processing plant assumes all administrative expenses for processing orders that are also shrinking.

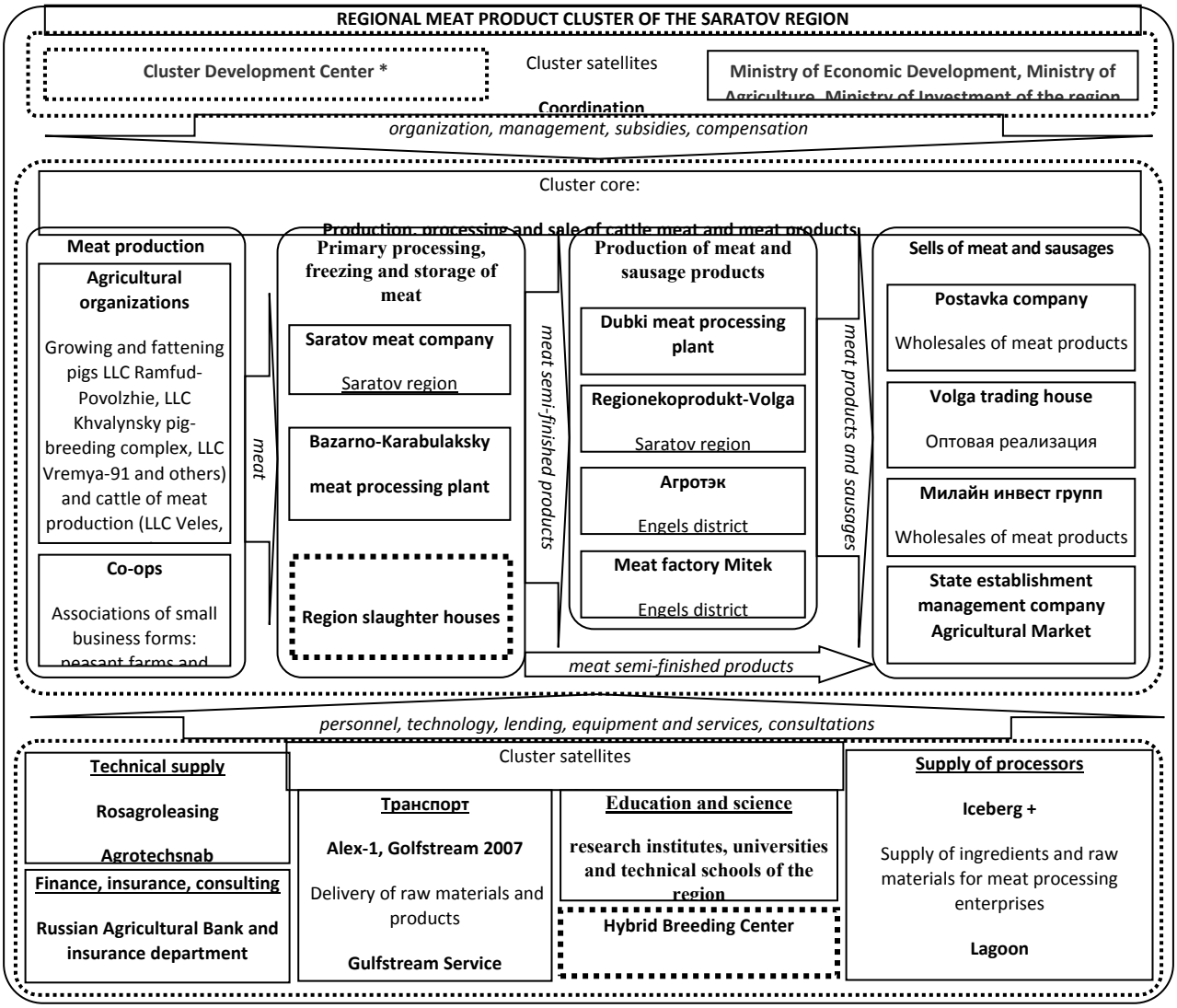

Fig. 5. The structural model of the cluster in the meat product subcomplex of the region (on the example of the Saratov region of Russia)
Source: Compiled by the authors.

Thus, on the way of meat and meat products from the agricultural enterprise, through the receiving point, processors and network distributor, to the consumer (store) when there are about four commodity exchange contacts, by eliminating duplicate operations and reducing overall costs, the following savings result:

•11.50% for transportation due to optimization of transport operation and its sharing;

•13.0 and 7.50% for warehousing and stocks due to the acceleration of the turnover of goods;

•2.25 and 3.0% on order processing and administrative expenses through arrangement and planning;

•1.50 and 2.50% on shipping and handling

and packaging due to its unification or reuse.
In this case, the overall savings will be 41.25, depending on the structure of costs for the processes of commodity circulation, which, taking into account their average share of about 25% in the selling price of meat products from the agro-industrial complex, allows reducing the cost of final products by 10.31%.
We also determined the effect in absolute terms on the basis of forecasts for the development of the agro-industrial complex of the Saratov region. Provided that cluster-based methods for organizing production based on the ubiquitous general savings from optimization of commodity exchange processes and stabilization of the regional market for animal products may amount to $ 112.3 million by 2025. And this, without taking into account the effect of introducing new technologies, creating workers places and increase the receipt of mandatory payments to budgets of all levels.

CONCLUSIONS

As a result, it can be noted that cluster activity is actively developing in the Russian economy, regulations are being adopted, and cluster projects are being developed.
The main base for the formation of clusters can be actively pursuing the processes of integration and clustering of agricultural and processing enterprises. Many agriculture holdings already now represent protocluster structures, including in the structure the supplying, serving and training elements.
The developed mechanism is a complex of organizational and economic measures to optimize the system development of integration and cooperation processes in the direction of clustering. The presented cluster model in the meat product subcomplex reflects the system of production and economic relations of the participants, based on consideration of their economic interests. The model in conjunction with the proposed mechanism is designed to deepen and expand inter-sectoral relations in various areas of the agro-industrial complex. production and consumer cooperation processes creates opportunities for growth in production and processing of products in small forms of rural entrepreneurship, availability of loans, improvement of sales organization of meat products by the cluster logistics network, ensures the consolidation and diversification of production. Ultimately, the systemic development of integration and cooperation processes will have a positive impact on the well-being of rural residents, economic entities of the industry and the degree of satisfaction of their needs.
Further development of theory and practice will only intensify, as evidenced by the increasing number of works on agroclusters. In these countries, agro-clusters have become the main mechanism for increasing the competitiveness of producers and their products entering international markets. It is safe to say that in the near future the development of theoretical foundations and the practical implementation of clustering processes will become the main direction for improving the competitiveness and efficiency of integration and cooperation of enterprises, regions and states. Thus, integration and cooperation on the basis of clustering serve as a powerful means of achieving the goals of economic policy to improve efficiency, competitiveness and innovative orientation of animal husbandry. In the future, it is territorial production clustering that will become the most important direction of the distribution of productive forces in the agro-industrial complex.

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THREATS AND RISKS OF ENVIRONMENTAL SAFETY OF LAND USE IN AGRICULTURAL OF UKRAINE

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Abstract

The article is devoted to the justification of the ecological and economic state of agricultural land use based on an analysis of the existing threats and risks of environmental safety in this area. The main threats and risks of environmental safety in Ukraine's agricultural land use are characterized, in particular: excessive plowing, low ecological stability of territories, land degradation and erosion, loss of nutrients and soil fertility, negative nutrient balance, insufficient use of organic substances, general soil contamination and like that. According to the results, it was established that the content of humus in soils due to long-term use has a certain dependence on the amount of organic fertilizer applied in these areas. It is proved that the vast majority of these threats and risks of environmental safety of agricultural land use has caused an inefficient process of transformation of land relations. At the same time, it was determined that the threats and risks of the environmental safety of land use in agricultural can cause environmental hazards, taking into account negative multiplier and synergistic effects. It has been substantiated that the main threats and risks of environmental safety in agricultural land use have been identified without introducing a system of ecologically-balanced use of agricultural land can cause a complete loss of the potential of the fertile layer. At the same time, the identification of threats and risks makes it possible to simulate measures to counteract the influence of eco-destructive factors and form the mechanism for their implementation, taking into account the sectoral specificity of agricultural land use.

Key words: *threats, risks, environmental safety, agricultural, land use, degradation.*

INTRODUCTION

Implementation in the agricultural sector of Ukraine intensive methods of agricultural production oriented exclusively on economic development, has led to the disruption of the ecological balance between economic activity and agro-ecosystems. The consequence of this is the manifestation of degradation processes in agricultural land use, which directly affect not only the environment, but also human health and life activity in general [12].

One of the main reasons for the emergence of a set of ecological and economic problems in the system of agricultural land use is the transformation of land relations of Ukraine to the market type without effective reforming mechanisms. Studies of the problems of agricultural land use are devoted to the works of well-known domestic scientists and economists. A great contribution to the development of theoretical and methodological research and the development of practical recommendations on the formation of agricultural land use made S.Volkov [13] and M. Stupen [12]. Coverage of the problems of assessment and protection of agricultural land is reflected in the works of S. Balyuk [1], A. Kucer [1], V. Medvedev [5], I. Plesko [5], V. Mineev [6] and others.

The results of the developments of these scientific areas are of great importance for the domestic agricultural sector in the process of improving the management system and ensuring the environmental safety of land use. It is known that ecosystems have inherent relative resistance to external and internal impacts, however, certain types of activities can lead to changes in the state of natural components and affect the performance of other types of activities. In particular, pollution of land resources leads to a decrease in crop yields, pollution of water bodies with pesticides or mineral fertilizers reduces the

efficiency of fisheries. That is, the result of external effects due to the primary effect of pollution sources is traced.

However, the range of the above questions is wide enough and debatable and requires more basic scientific research and justification.

To harmonize environmental and economic interests in the field of agricultural land use, it is necessary to reform the system of motivations, change the mechanism for managing economic development, the organic component of which should be the strategy of ensuring environmental safety in the land use system based on an analysis of existing environmental threats and risks.

MATERIALS AND METHODS

An important element of the methodology for ensuring environmental safety of land use in agriculture is the approach to identifying environmental threats and risks. Challenges, threats and risks are categories whose essence lies in the uncertainty of the actual expected result in a management and evaluation situation. These categories have a dialectical objectively subjective structure. Therefore, the identification of threats and risks of environmental safety in the agricultural sector, as well as the forms of their manifestation, should be investigated from the perspective of a dialectical approach.

The dialectical approach allows to substantiate the causal relationships, the processes of differentiation and integration, the constant contradiction between essence and phenomenon, content and form, to ensure objectivity in the assessment of reality.

To determine the indicators of the ecological stability of land use, the standards of the coefficients of ecological stability for various types of land have been applied according to the method of S. Volkov [13, p. 138].

The informational basis of the study consists of domestic and international legislative and regulatory acts in the field of land resources, materials and reports of the State Statistics Service of Ukraine, the Institute for Soil Conservation of Ukraine, domestic agricultural enterprises, as well as methodological recommendations of scientific institutions, other literary sources, materials of their own studies characterizing the level risks and threats to environmental safety in highly coherent land use.

RESULTS AND DISCUSSIONS

The most noticeable result of agrarian reforms was the emergence of a variety of forms of land ownership and payment for its use. However, along with an attempt to form a private owner, owner of the land, Ukraine lost its monopoly ownership of agricultural land. Thus, land reform in Ukraine is due to a change in the system of land relations due to the introduction of a variety of land ownership forms and business forms, together with a change in the sectoral structure of the economy, which affected the structure of the land fund for its intended purpose [11]. However, the distribution of land resources according to their economic use today does not have a comprehensive environmental and economic justification [14]. Simultaneously with the forms of management in Ukraine, the composition and structure of agricultural land changed (Table 1). This, in turn, contributed to the formation of a continuously variable land redistribution fund, reflecting the transfer of ownership of land taking into account various forms of management.

Table 1. Dynamics of the structure of Ukrainian agricultural lands (thousand hectares)

Years / share	Types of agricultural land				
	Total	**Arable**	**Perennial planta-tions**	**Shoots and pastures**	**Fallow**
1990	42,030.3	33,570.8	1,058.0	7,396.5	5.0
% of total area	100.0	79.9	2.5	17.6	0.01
1995	41,852.9	33,286.2	1,037.9	7,523.8	5.0
% of total area	100.0	79.5	2.5	18.0	0.01
2000	41,827.0	32,563.6	931.9	7,909.9	421.6
% of total area	100.0	77.9	2.2	18.9	1.0
2005	41,722.2	32,451.9	900.5	7,950.5	419.3
% of total area	100.0	77.8	2.2	19.1	1.0
2010	41,576.0	32,476.5	896.5	7,892.8	310.7
% of total area	100.0	78.1	2.2	19.0	0.7
2017	41,507.9	32,541.3	892.4	7,848.3	233.7
% of total area	100.0	78.4	2.2	18.9	0.6

Source: Calculated according to State Service of Ukraine for Geodesy, Cartography and Cadastre.

Thus, over the past decades, our country has developed a too high level of development of the territories. More than 70% of the total land area is attracted to economic use, which greatly exceeds the permissible limits and can provoke the manifestation of environmental threats and risks. In recent years, there has been a tendency to a decrease in this share, although so far the rate of economic use of territories is much higher than that of developed countries of the world. For example, in Europe, the share of arable land averages 30-35%, while in Ukraine this figure reached 54%. The efficiency of land use and environmental protection is significantly worsened by the current structure and land use imbalance, which leads to a reduction of restoration processes in soils, their degradation and deterioration of biodiversity (as regards both flora and fauna).

In modern science, there are several levels of environmental destructive factors: the emergence of a risk zone is the probability of a condition that can give rise to danger; threat – possible danger; danger – the real probability of harm [3; 9]. Assessment of the state of land use and the influence of eco-destructive factors on it is carried out in the plane of the most important processes occurring in the agro-ecosystem, the production activities of agricultural producers and affect human health.

The assessment of the state of ecological stability of land use on the territory of Ukraine demonstrates (Table 2) that the ecological stability of the country is stable and unstable with a stability coefficient of 0.41.

The calculations of indicators of environmental stability of land use showed that in recent years, indicators of environmental stability of the territory as a whole in Ukraine almost did not change. However, it should be noted that the seven regions belong to the category of regions with an unstable level of ecological stability of the territories, namely, Vinnytsia, Dnipropetrovsk, Donetsk, Zaporizhia, Kirovohrad, Mykolayiv and Odesa.

Intensification of agriculture also negatively affected the agro-system due to the use of mineral fertilizers. It should be noted that the risks of soil contamination with chemical plant protection products and mineral fertilizers are caused not so much by their excessive application as by the violation of their application technologies and the ratio of nutrients. Failure to comply with the technology and application of nitrates also affects the quality of crop production. Nitrates are toxic for most species of animals and fish, so water with a high content of nitrates is quite dangerous for their existence [6; 7].

Table 2. Characteristics of ecological stability of land use by regions of Ukraine (2017)

Region	Coefficient of environmental sustainability	Ecological stability
Cherkasy	36	Unstable stable
Chernihiv	46	Unstable stable
Chernivtsi	52	Moderately stable
Crimea*	38	Unstable stable
Dnipropetrovsk	28	Unstable
Donetsk	29	Unstable
Herson	33	Unstable stable
Ivano-Frankivsk	60	Moderately stable
Kharkiv	34	Unstable stable
Khmelnytskyi	34	Unstable stable
Kirovohrad	28	Unstable
Kyiv	45	Unstable stable
Luhansk	36	Unstable stable
Lviv	55	Moderately stable
Mykolayiv	28	Unstable
Odesa	32	Unstable
Poltava	34	Unstable stable
Rivne	60	Moderately stable
Sumy	42	Unstable stable
Ternopil	34	Unstable stable
Transcarpathian	74	Stable
Vinnytsia	32	Unstable
Volyn	59	Moderately stable
Zaporizhia	28	Unstable
Zhytomyr	50	Unstable stable
Ukraine	41	**Unstable stable**

Source: calculated according to State Service of Ukraine for Geodesy, Cartography and Cadastre.
*Data for 2014 for the temporarily occupied territory of Crimea

According to the State Statistics Service of Ukraine in 2017, agrarian enterprises under crop crops on an area of about 18.0 million hectares in total, 2,028.0 thousand tons of mineral fertilizers (in nutrients) were applied, which is almost half as many as in 1990 (Table 3).

Thus, 123 kg were added to 1 hectare of sown

area in 2017, which is 18 kg less than in 1990. Negative consequences of non-compliance with the technologies of operation of agro-ecosystems are the threat of soil acidification, a decrease in their fertility, in turn, leads to a decrease in crop yields, as well as deterioration of product quality through increased nitrate content. Special threats and risks are caused by a tendency to increase the amount of mineral fertilizers applied against the background of a decrease in organic fertilizers.

Table 3. Dynamics of organic and mineral fertilizers in nutrients in Ukraine, 1990-2017

Indexes	Years				
	1990	**2000**	**2010**	**2017**	**2017 in % to 1990**
Organic fertilizer applied, thousand tons	260,727	28,964	9,964	9,274	3.6
Mineral fertilizer applied, thousand tons	4,242	279	1,061	2,028	47.8
including 1 hectare, kg	141	13	58	123	87.2
Proportion of fertilized with mineral fertilizers, %	83	22	70	89	107.2
Nitrogenous, thousand tons	1,784	223	775	1,365	76.5
Phosphorus, thousand tons	1,280	38	157	363	28.4
Potassium, thousand tons	1,178	18	129	299	25.4

Source: Calculated according to State Statistics Service of Ukraine.

Over the past five years, the application of organic fertilizers (which are the main source of replenishment of nutrients in the soil, an increase in the content of humus, as well as the conservation and expanded reproduction of soil fertility) is almost completely suspended.

On a national scale, ensuring environmental security in the agricultural sector, land resources and their condition are considered as the main component of agro-ecosystems in the territorial context. The results of the monitoring of land resources and soils of Ukraine indicate that their condition has deteriorated in recent decades and if the necessary measures are not taken, the degradation processes will continue, and the fertile black soil will turn into unproductive and degraded soils. The degradation processes of land resources are characterized by a number of negative manifestations, such as: changes in the natural landscapes, increased negative effects of erosion, flooding and land pollution and destruction of the natural soil structure. One of the significant environmental risks was water and wind erosion. Due to the deterioration of the agronomical properties of eroded soils, significant losses of humus, nutrients and water from erosion, a decrease in crop yields is observed [4]. According to the Institute of Soil Protection of Ukraine, the area of eroded soils in Ukraine is 15,953.9 thousand hectares (40%, respectively, of the total area), including 12,940.3 thousand hectares of arable land, or 38.4% (Table 4). Water erosion is one of the most common types of soil destruction. During water erosion, the main destructive effect on the soil is caused by the blows of raindrops and the erosion of its surface by water flows (irrigation (irrigation), thawed, rain). Wind erosion (or in other words, deflation) is the process of separating, moving, and depositing the upper part of the soil with the help of wind forces. Wind erosion is of two types: local and dust storms. Local wind erosion is characterized by the movement of dry soil particles at a relatively calm wind speed (4-8 m / s) [3; 9]. Destruction of soil under the action of wind erosion leads to a decrease in their fertility, damage or the complete destruction of crops, dispersing fertilizers out of arable land, in turn, leads to a loss of their effectiveness and increases the pollution of the environment. As a result, entire ecosystems are degraded and the natural balance is disturbed. In addition to environmental risks, the expansion of eroded land has a negative impact on the efficiency of agricultural production. Against the background of land degradation, low amounts of organic fertilizer application and imbalance of the fertilizer system for nutrients, deterioration of soil fertility indicators is observed. So, in Ukraine for 1990-2017. The soil fertility index (calculated on the basis of humus in the topsoil) decreased from 1.00 to 0.70 (Fig. 1).

Table 4. The areas of eroded lands of Ukraine in the context of regions (2015), thousand hectares

Region	Agricultural land	*including arable*	Eroded lands		*including arable*	
			total	% of total agricultural land	total	% of total agricultural land
Cherkasy	1,451.4	1,271.6	326.6	22.5	286.1	22.5
Chernihiv	2,076.7	1,396.1	81.0	3.9	53.3	3.8
Chernivtsi	471.2	333.9	124.2	26.4	88.5	26.5
Crimea*	1,798.4	1,265.6	999.3	55.6	919.3	72.6
Dnipropetrovsk	2,514.3	2,125.0	1,104.8	43.9	914.7	43.0
Donetsk	2,045.2	1,656.0	1,757.4	85.9	1,080.0	65.2
Herson	1,971.1	1,777.6	686.2	34.8	961.0	54.1
Ivano-Frankivsk	631.9	381.6	133.7	21.2	98.4	25.8
Kharkiv	2,418.7	1,926.6	996.3	41.2	791.2	41.1
Khmelnytskyi	1,568.4	1,254.8	628.4	40.1	501.9	40.0
Kirovohrad	1,668.4	1,360.6	157.9	9.5	128.8	9.5
Kyiv	2,039.9	1,762.4	1,102.4	54.0	886.7	50.3
Luhansk	1,911.1	1,269.7	1,372.3	71.8	1,237.9	97.5
Lviv	1,267.8	797.2	525.0	41.4	380.1	47.7
Mykolayiv	2,010.0	1,698.1	964.5	48.0	914.8	53.9
Odesa	2,593.4	2,067.6	1,214.0	46.8	1,081.6	52.3
Poltava	2,175.7	1,768.8	517.7	23.8	420.3	23.8
Rivne	933.9	658.0	323.3	34.6	224.2	34.1
Sumy	1,701.6	1,232.8	305.1	17.9	176.3	14.3
Ternopil	453.2	200.6	39.6	8.7	35.5	17.7
Transcarpathian	1,049.7	854.0	244.0	23.2	239.7	28.1
Vinnytsia	2,017.1	1,729.0	687.5	34.1	593.1	34.3
Volyn	1,051.4	674.3	362.4	34.5	225.4	33.4
Zaporizhia	2,247.7	1,906.7	1,212.5	53.9	640.8	33.6
Zhytomyr	1,526.9	1,092.8	87.8	5.8	60.7	5.6
Ukraine	1,798.4	1,265.6	999.3	55.6	919.3	72.6

Source: formed by the author according to the Institute of Soil Conservation of Ukraine.
* Data for 2010 for the temporarily occupied territory of Crimea

In turn, due to the lack of a reasonable and necessary number of measures to restore the balance of nutrients in the soil, there is a negative balance of humus in it. Over the past 10 years, the humus balance was in short supply, its losses amounted to 0.1-0.6 ton / hectare [8]. Degumification is one of the dangerous degradation processes of the soil, as a result of which their fertility decreases. Thus, the duration of soil use under arable land, the composition and alternation of crops in crop rotations, soil treatment systems, types, volumes and technologies of applying organic and mineral fertilizers, manifestations of degradation processes, land reclamation measures (irrigation, drainage, chemical amelioration), the level of crop yields as an endogenous factor, causes the removal of nutrients from the soil layer, all this in a complex directly affects the content of humus in the soil [5, p. 49].

The increase in the content of organic matter only simulates the restoration of the balance of humus, but does not replace it on an equal basis. V.V. Dokuchaev argued that the soil is a complex natural-historical formation and the result of a long-term interaction of many natural factors that a person cannot fully reproduce. Therefore, the focus should be on soil conservation and their primary natural properties.

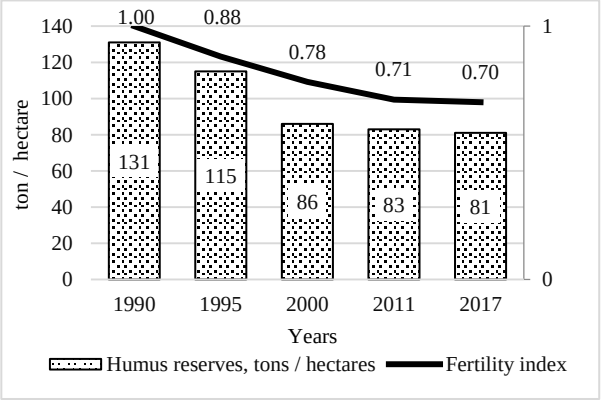

Fig. 1. The condition of the soil cover of Ukraine on fertility index
Source: formed by the author according to the Institute of Soil Conservation of Ukraine.

The scientist proposed to establish the minimum permissible temporary norms of erosion, providing for the loss of soil cover not more than 0.2-0.5 ton / hectare per year [2]. A decrease in soil fertility also indicates a negative balance of humus and nutrients. During the period of intensive chemicalization (1976-1990 pp.) the balance of nutrients was on average 20-30 kg / hectare, above the equilibrium state [10]. Since the 90s, the negative balance of all batteries has been recorded annually.

CONCLUSIONS

Thus, over the years of transformation of land relations in Ukraine, environmentally balanced land use has not been formed. The inefficient process of transformation of land relations has caused an ecological imbalance of the land fund, has caused the destruction of the system of land protection, as well as the ability of natural restoration of soil fertility. The analysis made it possible to identify the threats and risks of environmental safety in agricultural land use, namely: excessive and unreasonable use of mineral fertilizers and chemical plant protection chemicals; reduction in the amount of organic fertilizer at a meager level of compliance with sound standards; land degradation and erosion; loss of nutrients and soil fertility, and the like. At the same time analyzing the threats and risks of the environmental safety of agricultural land use can cause environmental hazards, it is necessary to take into account multiplier and synergistic effects. Therefore, the ecological and economic situation in the field of land relations, land use, land management and land protection remains difficult and requires urgent measures to improve it.

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APPROPRIATE CROP ROTATION – COMMERCIALLY A REASONABLE EFFORT

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Abstract

The aim of the article is to analyze optimization of cropping area of scientifically-based crop rotations in agriculture of Ukraine. Scientific solution of the set tasks required application of statistical data about cropping area in Ukraine, presentation of economic data of cultivated field crops in crop rotations. The authors of the article analyze long-continued research by the scientists of the Institute of Grain Crops of NAAS of Ukraine and suggest that yield capacity is much higher under scientifically-based crop rotations without application of fertilizers than under the variant of no crop rotation applied. The work studies optimization of the number of fields in a crop rotation. It is determined that efficiency of many-field crop rotation secures high level of agrarian production, and for enterprises with a small area of land use, it is the most reasonable to apply short crop rotation.

Key words**:** *crop rotations, agriculture, cropping area, agricultural crops*

INTRODUCTION

Considering area and land fund, Ukraine is a large European country. Ukraine takes the sixth position among the leading countries of the world concerning the area of agricultural lands per one resident, and the first place in Europe concerning the area of arable land. Plowing of territory is a negative factor. It exceeds all threshold ecological standards and constitutes 57% (for example, Steppe zone of Ukraine is 81% plowed), while that indicator in Germany and France constitute 32%, and in England – 29.6%, in the USA – 16.9%. In Ukraine, cropping area of field crops is fixed at the level of almost 26-27 million ha (for the recent 30 years, there has been a gradual reduction of the indicator from 32.66 million to 30.96 million ha) [8]. Cereals occupy the area of 14.6-16.2 million ha [5]. Ukraine has almost exhausted all possibilities to increase the area of arable lands. Hence, more efficient use of employed soil is the main direction for increase of the agrarian products output.

Optimization of the structure of cropping area with consideration of scientifically-based recommendations, optimization of the structure of cropping area and crop rotation to improve productivity of agricultural lands, prevent erosion processes and make reclamation of soil layer fertility [4] are one of the components for solution of current problems of arable farming. Under market conditions, it should secure high profitability of production. The amount of crop yield per unit area, such as the productivity of crops, depends on the whole set of environmental conditions as well as on the manager's experience, which can alter the natural factors or the crop's qualities to the best of the conditions natural [3]. However, the structure should be also mobile to consider urgent needs of production. Moreover, developing optimization of the structure of cropping area it is necessary to focus not only on the possibility of present economic benefit, but on setting of soil conditions, which support balanced use of biological and natural factors, and reclamation of soil fertility.

MATERIALS AND METHODS

The aim of the article is to analyze and make comparative characteristics of scientifically-based crop rotations, which supply the most complete employment of biological peculiarities of each crop, providing the opportunity to obtain permanent high yields.

Scientific solution of the set tasks applied the method of comparative analysis. The work

analyzes introduction of scientifically-based crop rotations and argues efficiency of arable land use in Ukraine.

RESULTS AND DISCUSSIONS

Nowadays, one observes considerable deviations from the recommended parameters of the structure of cropping area, which have both objective and subjective character. Thus, a great reduction of animal breeding production in Ukraine for the recent years has caused uncontrolled reduction of cropping area of fodder crops from 29-35% to 4-6%. Continuous growth of demand for sunflower seed both in Ukraine and in the world has caused ecologically dangerous extension of the area, occupied by oilseed. For that period, its cropping area increased from 10-12% to 34-37% (at some enterprises of southern area of Steppe – up to 50%). Permanently high prices for seed of that crop secures profitability of any agrarian enterprise and solution of the urgent problems of survival under market conditions. However, long-term effects of such phenomenon are not considered, particularly a heavy deterioration of phytosanitary conditions of soil and moisture supply on the cropping area of some following crops, causing reduction of their yield capacity. Many enterprises of Ukraine unwarrantedly reject application of a clean fallow, which, for example, in the Steppe is the only predecessor of winter wheat and secures obtaining of high grain yield regardless of autumn weather conditions. All this makes negative impact on the structure of crop rotations and forces the necessity to place winter wheat after unfavorable predecessor (particularly sunflower), causing considerable losses and deterioration of ecological conditions of soil.

Introduction of scientifically-based crop rotations, which consider biological particularities of each crop, is an important factor of arable soils employment. It secures obtaining of permanently high yields. That effect is commercially and ecologically argued and does not require additional capital investments. On the other hand, good management of the soil through crop rotation ensures adequate nutrient availability throughout the cropping season and maintain balanced soil ecosystem [6, 7]. Crop rotations should become a basic, essential link of the modern system of arable farming, which defines rational organization of the territory and procedure of rotation of crops in time and space.

Growing of field crops in crop rotations makes positive impact on regulation of nutritive and water regimes (due to more commercial use of productive moisture); prevention of the phenomena of soil fatigue; regulation of phytosanitary conditions of crops, reduction of the level of diseases and pests; rational use of bioclimatic potential of the region. Rotation of the crops causes changes of the factors of soil chemical, physical and biological properties.

The necessity to rotate crops is based on a different need for nutrients and water in some periods of growth and development, on the different level of competitive capacity in the fight against weeds for the main factors of living. Optimization of the conditions of growth, development and creation of crop yield requires from each crop to be proceeded by favorable ones in crop rotation.

The author of the work analyze long-continuous investigations by the scientists of the Institute of Grain Crops of NAAS of Ukraine (Dnipropetrovsk) which confirm that, comparing to growing of crop under many-field crop rotation, continuous growing (during 10 years) of agricultural crops on both unfertilized and fertilized grounds, results in a considerable reduction of yield capacity of almost all field crops. Hence, while growing winter wheat under the crop rotation without fertilizers, yield capacity of that crop is by 80% higher than on unfertilized fields. On the variant of organic-mineral fertilization, increase of yield in crop rotation constitutes 42%, the similar data for grain maize demonstrate 51 and 18.6% respectively, sunflower – 21.3 and 14.5, pea – 26.6 and 19.3%. Reduction of yield under continuous crop growing occurs due to soil fatigue, irrational use of nutrients, negative changes in the regimes of moisture use. The obtained data give a strong argument for prohibition of

continuous growing of one crop in production. Generally, introduction of crop rotations raises efficiency of arable lands employment minimum by 15-20%. Nevertheless, depending on the size of an enterprise and its specialization, it is possible to introduce both short (3-5 fields) and many-field (6-9 fields) crop rotation.

Considering importance of development and introduction of crop rotation for the following gradual development of agrarian production in Ukraine, scientific investigations on the issue are performed by some leading research institutions of NAAS. They are based on principal issues of improvement of the structure of crops and optimization of crop rotation, and on raise of efficiency of 7-8-field long-term and 3-5-field short field crop rotation on the variant of different systems of fertilization and soil treatment.

Analysis of efficiency of 8-field crop rotation in a long-lasting stationary field experiment confirms that the largest yield of grain is obtained on fertilized variants of cereal-fallow-row crop (2.71-2.83 tons per hectare) and cereal-row crop (2.66-2.80 tons per hectare) systems of crop rotation with 75% of cereals. Reduction of the share of cereals in the structure of cereal-grass-row crops rotation up to 50% results in reduced yield of grain, which constitutes 2.20-2.31 tons per hectare. Yield capacity of cereals is maximum in the variant of cereal-grass-row crop rotation (4.63-4.85 tons per hectare), and under cereal-fallow-row crop and cereal-row crop system, that indicator on the average is by 43 and 35% smaller that can be explained by different predecessors and structure of cereals.

Maximum yield of fodder units is obtained under cereal-row crop (5.51-5.78 tons per hectare) and cereal-grass-row crop rotation (5.26-5.37 tons per hectare), and under cereal-fallow-row crop system, it is only by 0.17-0.2 tons per hectare smaller than the indicators of cereal-grass-row crop rotation. Higher efficiency of the studied crop rotations is secured by the variants with organic-mineral or mineral system of soil fertilization (Table 1).

Application of those fertilization systems secures reclamation of soil fertility. The authors of the work have analyzed that in the similar experiments with 7-field crop rotation, the highest yield of grain is obtained on fertilized variants of cereal-grass-row crop rotation (2.41-2.66 tons per hectare), while yield capacity of cereals is higher in the crop rotation with fallow field (3.81-4.43 tons per hectare). Yield of fodder units and yield of digestible protein is some higher (by 6-10% on the average) under cereal-grass-row crop rotation. Higher indicators of crop rotation efficiency are secured by mineral and organic-mineral system of fertilization (Table 2).

Table 1. Efficiency of 8-field crop rotation, depending on the structure of crops and fertilization on the average for 2013-2018, tons per hectare

System of soil fertilization in crop rotation*	Indicators of crop rotation efficiency			
	grain yield	yield capacity of cereals	yield of fodder units	yield of digestible protein
Cereal-row crop rotation (75% of cereals)				
No fertilizers	2.57	3.55	4.80	0.426
Organic	2.71	3.74	5.06	0.450
Organic-mineral	2.83	3.90	5.25	0.469
Mineral	2.83	3.92	5.29	0.470
Cereal-fallow-row crop rotation (75% of cereals)				
No fertilizers	2.54	3.52	5.29	0.466
Organic	2.66	3.68	5.51	0.486
Organic-mineral	2.80	3.87	5.78	0.551
Mineral	2.78	3.84	5.68	0.503
Cereal-grass-row crop rotation (50% of cereals)				
No fertilizers	2.08	4.37	5.03	0.503
Organic	2.20	4.63	5.26	0.527
Organic-mineral	2.31	4.84	5.37	0.531
Mineral	2.31	4.85	5.32	0.517

*Applied per 1 hectare of crop rotation area under appropriate systems of fertilization: organic: manure – 12.5 tons per hectare; organic-mineral: manure – 7.5 tons per hectare.

Source: Completed by the authors.

Hence, results of the research of the efficiency of many-field crop rotations confirm that they secure a high level of agrarian production efficiency and can be applied at agrarian formations of different specialization, employing large area.

For enterprises with small area of land use it is the most reasonable to use short crop rotations. For example, on ordinary black land fertile soils of Kirovohrad research station,

they tested efficiency of 5-field crop rotation with 20, 40, 60 and 100 % of soybean (Table 3).

Table 2. Efficiency of 7-field crop rotation, depending on the structure of crops and fertilization of soil on the average for 2013-2018, tons per hectare

System of soil fertilization in crop rotation*	Indicators of crop rotation efficiency			
	grain yield	yield capacity of cereals	yield of fodder units	yield of digestible protein
Cereal-fallow-row crop rotation				
No fertilizers	1.90	3.33	4.12	0.34
Organic	2.17	3.81	4.58	0.34
Organic-mineral	2.43	4.25	4.85	0.37
Mineral	2.53	4.43	4.90	0.39
Cereal-grass-row crop rotation				
No fertilizers	2.03	2.98	4.67	0.38
Organic	2.41	3.37	4.78	0.42
Organic-mineral	2.60	3.64	5.08	0.44
Mineral	2.66	3.73	5.25	0.44

*Applied per 1 hectare of crop rotation area under appropriate systems of fertilization: organic: manure – 14.3 tons per hectare.
Source: Completed by the authors.

Table 3. Efficiency of crop rotations, depending on the share of soybean and fertilization system on the average for 2010-2018, tons per hectare of crop-rotation area

Crop rotation	Fertilization system	Cereal units	Fodder units	Digestible protein
Cereal-fallow-row crop (20% of soybean)	no fertilizers	4.38	4.92	0.57
	mineral	4.54	5.07	0.60
	organic-mineral	5.04	5.81	0.71
Cereal-row crop (40% of soy bean)	no fertilizers	4.39	5.37	0.52
	mineral	4.71	5.72	0.56
	organic-mineral	4.71	5.77	0.56
Cereal-row crop (60% of soy bean)	no fertilizers	4.69	5.45	0.61
	mineral	4.57	5.30	0.59
	organic-mineral	4.50	5.24	0.58
Continuous growing of soy bean for 9 years	no fertilizers	3.08	2.66	0.52
	mineral	3.44	2.96	0.58
	organic-mineral	3.16	2.73	0.54

Source: Completed by the authors.

Estimation of the efficiency of short crop rotation reveals gradual reduction of their productivity effected with increase of the share of soybean. The highest level of efficiency was secured under cereal-fallow-row crop rotation with 20% of soybean (black or green-manured fallow – winter wheat – soybean – grain maize – sunflower) under application of organic-mineral system of fertilization. Continuous growing of soybean is the least efficient system.

Negative effect of increased concentration of black fallow is revealed in growth of the deficiency of humus balance (on the average for 2013-2018). Under total gathering of by-products with the yield, deficiency of the estimated humus balance on the average on the grounds of nutrition constituted 997 kilogram per hectare. Positive balance of humus is marked on fertilized variants with 20% of green-manured fallow.

According to the obtained data, the most perspective is the variant of crop rotation with 20% of fallows, 50% of cereals (including the food group from 20 to 40%) and industrial – 30% (including 10% of sunflower and 20% of winter rape). In the structure of field crop rotation, it is necessary to reduce the share of sunflower to scientifically-based norms by means of substitution of a share of its crops with maize and rape (10 and 20% respectively), that enables increase of the group of profitable industrial crops in crop rotation of short system up to 30%.

It is worth mentioning that efficiency of crop rotation sufficiently depends on the structure of crops and correlation of field crops in them (Table 4). The largest yield of grain, fodder units and digestible protein is secured by the crop rotation with pea.

Thus, mineral fertilizers contribute to increase of the output of products, but deteriorate the main parameters of commercial efficiency of crop rotation due to high cost of the fertilizers and necessity of extra costs for their application, as well as not high growth of yield by means fertilization of some crops in crop rotation. However, the described phenomenon does not mean that one can recommend growing of crops in crop rotation with no fertilizers applied, because it causes losses of fertility and deterioration of agro-chemical and agrophysical parameters of soil. Hence, under disparity of prices of industrial and agricultural products, it is necessary to

secure effective governmental support for commodity-producers in the form of laws, working in the European Union.

Table 4. Efficiency of crop rotation, depending on the structure of crops on the average for 2013-2018, tons per hectare of cropping area

Crop rotation			Indicators of crop rotation efficiency		
First field	Sec-ond field	Third field	grain yield	yield of fodder units	yield of digestible protein
Black fallow	Winter wheat	barley	1.99	3.21	0.28
		sorgo	2.28	3.52	0.32
Pea		barley	2.24	3.76	0.35
		sorgo	2.50	3.71	0.38
Seeded fallow		barley	1.54	3.02	0.30
		sorgo	1.80	3.29	0.33
Green-manured fallow		barley	1.52	2.52	0.22
		sorgo	1.76	2.77	0.25
Sun-flower		barley	1.42	3.32	0.26
		sorgo	1.63	3.45	0.28

Source: Completed by the authors.

Crop rotation is an important and efficient constituent of rational use of arable lands in Ukraine to obtain high and permanent yields, raise profitability of agricultural production and reclaim soil fertility [1, 2]. Scientific institutions of the NAAS have developed and recommended crop rotations for enterprises with different area of land use and specialization. Application of such crop rotations will support effective solution of technological tasks and consequently will supply maximum yield with the following both domestic consumption and export to the world market of competitive agrarian products.

CONCLUSIONS

Thus, introduction of scientifically-based crop rotations is the most important factor of efficient employment of arable soils. It secures the most completely engagement of biological peculiarities of each crop, supporting permanent high yields. That method is economically and ecologically argued and does not require additional investments. Crop rotation should be basic, essential link of the modern system of arable farming, which determines rational organization of the territory and order of rotation of the cultivated crops in time and space.

It is substantiated that under introduction of crop rotation, efficiency of arable land employment increases by 15-20%. However, introduction of short (3-5 fields) and many-field (6-9 fields) crop rotation should be specified by sizes of enterprises and their specialization.

Application of crop rotation is an important and efficient constituent of rational use of arable lands in Ukraine for obtaining of high and permanent yields, increase of profitability of agricultural production and reclamation of soil fertility.

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ANALYSIS OF AGRITOURISM AND RURAL TOURISM SITUATION IN THE NORTH EAST OF ROMANIA

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Abstract

In Romania, rural tourism and agro-tourism were practiced in an unorganized way until 1989, as tourists sought a cheaper accommodation compared to the standard accommodation units. Since 1989, gamma services have been improved, so more homes for locals have been opened for tourists. Hence the need for an organization of accommodation, homologation and classification, and the first forms of organized rural tourism appeared in the Rucăr-Bran area, with the establishment of ANTREC, which was then developed at national level. As a result of these changes, as well as the tendency to improve and modernize the tourist activities carried out in rural areas, rural tourism and agrotourism have started to occupy an important place in the Romanian tourist offer, representing for the eager ones an attractive alternative in view leisure time. As a result of the development of legislation, rural tourism and agritourism have seen a significant development, increasingly aligning with European standards in this area. In this paper we propose to analyze the situation of the tourist and agro-touristic pensions situated in the largest development region in Romania, the North East Region, which has a rich history and tradition and whose tourism development could contribute to the economic growth of the area, representing at the same time a means of promoting Romania and its rich traditions.

Key words**:** *agritourism, rural tourism, rural development*

INTRODUCTION

Romania benefits from an exceptional tourist potential where two essential components are distinguished: the natural component represented by spectacular landscapes, favorable climatic conditions, varied relief, abundance of natural factors of cleanliness and the anthropic component represented by many monuments and objectives of secular art or religious museums and museum collections, ethnography and folklore elements of great beauty and originality, etc [1]. All these are attractive elements that can contribute to the achievement of the two desires that define rural tourism, namely, the production and valorisation of their own production through agro-tourism, respectively the promotion of traditional values.

Taking into account the new trend related to tourists' preferences to nature, the consumption of natural products, we consider that this type of tourism can be developed at present and can be a development option for rural areas.

This is also found in the definition of rural tourism, being a type of tourist services practiced in rural areas and a concept that includes the organized tourism activity conducted by the local population, based on a close connection with the natural, natural and human environment [2]. It became, in the '90s, "the major branch of the tourism industry in Romania, reaching the similar phenomenon from other European countries" [5].

Agrotourism, as a particular form of rural tourism, is limited to the peasant household to the value of the natural environment, the accommodation offer and agro-tourism services, with a narrower offer than rural tourism [4].

Although agritourism and rural tourism are two concepts that identify up to a certain level, each being complemented and outlined by different elements of classification, such

as: inputs, outputs, transformation activities and the external environment [3].

MATERIALS AND METHODS

Through the present paper we propose an analysis of the situation of rural tourism and agrotourism in the North - East region of Romania. The study looked at the evolution of the accommodation capacities found in the tourist and agro-tourist pensions related to the analyzed area. In this respect the statistical data that are found in the surveys carried out by the National Statistics Institute in Romania, as well as in the surveys of the Romanian Ministry of Tourism, have been analyzed. Various indicators such as: "number of accommodation places", "number of tourists - total", "number of foreign tourists", "length of stay - total", "duration of stay for foreign tourists", "number of pensions tourism and agritourism ". The methods underlying the study presupposed the calculation of the indicators as well as the interpretation of the results, as well as the analysis of the present situation, on the basis of which conclusions or suggestions were made that would lead to the improvement of the existing situation [6].

We consider that the analysis and interpretation of the indicators will contribute to the orientation of the actors involved in the management of the tourism activity in formulating the development strategies of agritourism and rural tourism in the North-East region of Romania.

RESULTS AND DISCUSSIONS

From an administrative point of view, Romania is divided into eight development regions, among them the North East Region being the largest, and part of the oldest historical region of Moldova. The North East Region consists of six counties (Bacau, Botosani, Iasi, Neamt, Suceava, Vaslui), with a surface of 36,850 sq. Km (which represents 15.46% of Romania's surface), with a population of 3,734,546 inhabitants. From this point of view, the region ranks first among the eight regions of Romania (17.27% of the population's population live in terms of population).

Geographically, the North-East region borders with Ukraine in the North, with Galati and Vrancea counties in the South, with the Republic of Moldova in the East and with the counties of Maramures, Bistrita-Nasaud, Mures, Harghita and Covasna in the West.

This area is characterized by the fact that it benefits from a harmonious combination of the relief forms, so that the mountains represent 30%, the subcarpathian relief is 30% and the 40%. The plains represent more than 70% of the surface belonging to the counties of Iasi, Botosani and Vaslui. In the Siret and Trotus basin lies in the eastern half of Romania, the county of Bacau, which has its important cities Targu Ocna and Moinesti. These cities have grown as a result of having rich natural resources (salt mountains). Tourist resort Slanic Moldova has curative natural waters, which are rich in salts.

Botosani is the county located in the northeastern part of Romania, being among the Siret and Prut rivers, being recognized by the personalities of the Romanian culture that have come from here: George Enescu, Mihai Eminescu, Nicolae Iorga, etc.

Iasi is the county located in the central-eastern part of Moldova, between the middle basin of the Prut River and the Siret River. The largest city is Iasi, which was the historical capital of Moldova and has 307,377 inhabitants. It is an important university center with 7 higher education institutions. Also in Iasi there is the most important orthodox cult site in Romania, the Metropolitan Cathedral.

Neamt is the county located in the northern central area of Moldova, being part of the Bistrita basin, the Siret basin and the Moldavian basin. The largest city is Piatra-Neamt, which is located near the Ceahlau massif and was historically certified in 1392. It is considered to be an "Olimp of Moldova", being one of the most important industrial objectives , but also tourist.

Suceava County is located in the northern part of Moldova, located in the upper part of the Siret and Bistrita basins, where some of the most beautiful churches are found, 11 of

which are included in the UNESCO World Heritage List.

Vaslui is the county that is in the eastern part of Romania. It is located in the Middle Barlad area, with a rich history, but not many monuments. Among the natural riches are the vineyards, being also known for the cognacs obtained from the wine and which have a very good quality.

Fig. 1. North-East Region, Romania
Source: INSSE.

As we can see, the North-East Region is remarkable because it has many developmental opportunities in terms of rural tourism, and especially of agritourism, given that its rural areas have both a picturesque natural setting, more slightly polluted and offering tourists multiple options to recreate, but which also has potential from a cultural and historical point of view. The North-East Region has an impressive number of churches, monasteries (Varatec, Voronet, Putna, Agapia, Sucevita, Moldovita, etc.), memorial houses and mansions, museums, inns or courtyards. Many of the cult objectives are unique in the world due to their beauty. In these rural areas there are many traditions and traditions, as well as handicrafts or customs, which materialize in works of art (ceramics, curtains, hand-woven rugs, fabrics, masks, folk instruments.

In the North-East Region the accommodation capacity in 2016 was 28,763 thousand seats, the largest share being owned by Suceava County with almost 37% of the total, followed by Neamt County with 24% and the counties of Bacau and Iasi close 16%.

Regarding the average length of stay, it was 1.94 nights / tourist, registering the lowest value in recent years. It was caused by the diminishing of long stays in the region, evidencing a shift to a weekend, occasional or transit tour. At the same time, however, the number of foreign nights / tourists was 2.18. Taking into account the existing tourism potential, we consider that this level is inferior to the existing possibilities. The number of tourists' arrivals at the level of the region was 1,084,045, of which the share of foreign tourists was almost 13%.

Table 1. Situation of accommodation capacity and tourist activity in the North - East Region, at the level of 2016

County	Accommodation capacity (thousands of places - days)	Arrivals (no persons)	Of which foreign tourists	Average length of stay	Of which foreign tourists
Bacau	4,686	134,550	13,196	2.53	3.11
Botosani	1,118	43,972	1,957	1.77	2.53
Iasi	4,284	298,657	50,800	1.82	2.12
Neamt	7,072	224,105	14,220	1.91	1.82
Suceava	10,610	342,710	51,750	2.22	1.64
Vaslui	993	40,051	3,196	1.43	1.83
Total	**28,763**	**1,084045**	**135,119**	**1.94**	**2.18**

Source: Data processing from the TEMPO database - online, INS [8].

Analyzing the situation of the tourist and agrotourist pensions existing in the area there is a number of 869 boarding houses. The largest number is found in Suceava County, followed by Neamt and Bacau counties. A smaller number is found in the counties of Iasi, Vaslui and Botasani.

Table 2. The situation of tourist pensions on 31.12.2017

Category	Bacau	Botosani	Iasi	Neamt	Suceava	Vaslui	The region N-E
Tourist guesthouses	98	13	53	185	342	15	**706**
Agrotourist hostels	6	4	11	29	101	5	**156**
Tourist stops			2	5			**7**
Total	**104**	**17**	**66**	**219**	**443**	**20**	**869**

Source: Data processing from the Ministry of Tourism database (www.turism.gov.ro) [7]

As a result, the largest share of hostel accommodation units in the North East region is owned by Suceava County with 51%, Neamt county by 25%, Bacau county by 12%,

Iasi county by 8% and Botasani and Vaslui counties by 2 % of total.

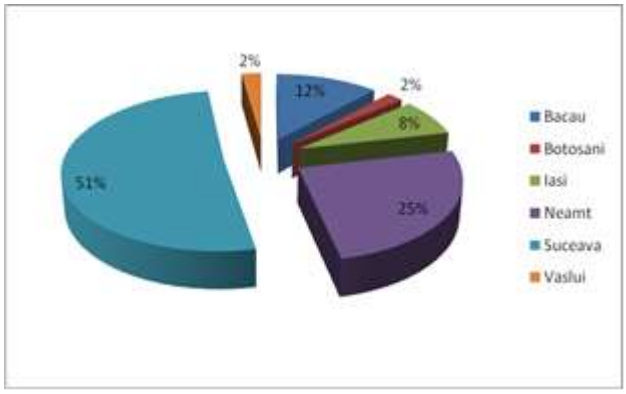

Fig.2. Breakdown by counties, accommodation units
Source: Data processing from the Ministry of Tourism database (www.turism.gov.ro) [7].

It is also noted that of the total of 869 accommodation units 81% are tourist hostels, 18% agritourist hostels and 1% tourist stops.

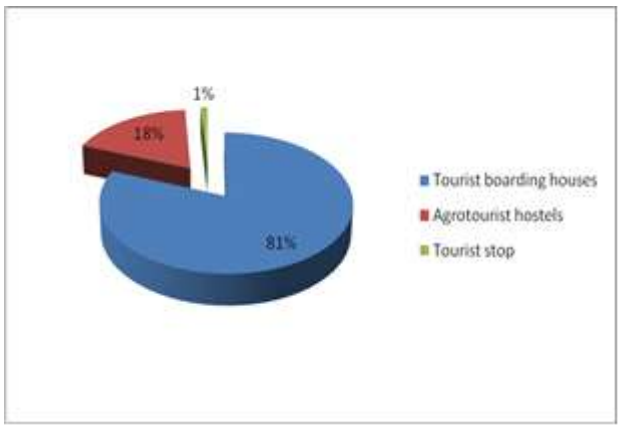

Fig.3. Structure of accommodation units
Source: Data processing from the Ministry of Tourism database (www.turism.gov.ro) [7].

In Romania, tourist and agritourist pensions are classified by number of flowers. Thus, the units can have 1 flower, 2 flowers, 3 flowers, 4 flowers or 5 flowers.

Table 3. The classification of tourist boarding houses on 31.12.2017

Category	Bacau	Botosani	Iasi	Neamt	Suceava	Vaslui	Area N-E Total
1 flower	4		2	5	6	3	20
2 flower	32	3	10	60	112	7	224
3 flower	61	10	46	131	233	9	490
4 flower	7	4	8	22	86	1	128
5 flower				1	6		7
Total	**104**	**17**	**66**	**219**	**443**	**20**	**869**

Source: Data processing from the Ministry of Tourism database (www.turism.gov.ro) [7].

From the analysis of the situation of the tourist and agritourist pensions, according to their classification there are 56% of the accommodation units classified with 3 flowers, 26% classified with 2 flowers, 15% classified with 4 flowers, 2% units classified with 1 flower and 1% units with 5 flowers. (Figure 4).

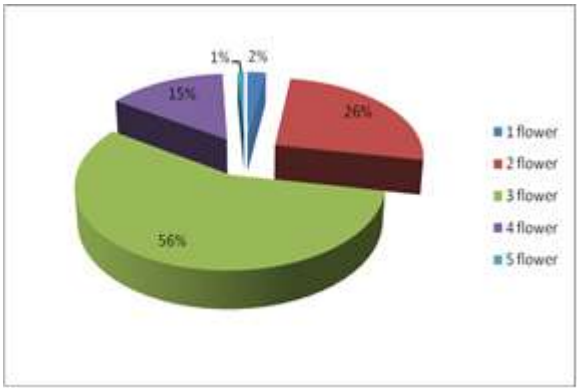

Fig.4. Distribution of accommodation units in relation to their classification
Source: Data processing from the Ministry of Tourism database (www.turism.gov.ro) [7].

It is found that at the level of Suceava county, best represented as number of boarding houses, the share of pensions classified with 3 flowers is 53%, out of the total of 443 accommodation units. Pensions with 2 or 4 flowers hold 25%, respectively 19% of the total number of accommodation units.
At the level of Neamt County of the total of 219 guesthouses, 60% are classified with 3 flowers, 27% with 2 flowers, 10% with 4 flowers and 2% with 1 flower, and at the Bacau county out of the total of 104 pensions 59% with 3 flowers, 31% with 2 flowers, 7% with 4 flowers and 2% with 1 flower.
At the level of Iasi County, out of a total of 66 guesthouses, 70% are classified with 3 flowers, 15% with 2 flowers, 12% with 4 flowers and 3% with 1 flower. The other 2 counties, Botasani and Vaslui, are less represented by the number of tourist accommodation units.
Given that many homeowners who can be converted into tourist boarding houses are skeptical about opening a business because of the legislative and fiscal "desis" that they need to interact with, we felt fit to make a presentation of the form the organization that

the owners have chosen for the opening of their business. It is worth mentioning that individual enterprises, family businesses, authorized individuals are united with no legal personality, and the tax they pay is 10% of net income or income from January 2018, compared to 16% was paid until December 31, 2017. At this tax rate, self-employed individuals also pay social security contributions of 25% of net income earned, 10% health insurance contribution, insurance contribution for work 2.25%, if it achieves cumulative incomes that are at least equal to 12 gross minimum wages per country. There is also a 1% insurance option for holidays and social security indemnities, and the calculation base can not be lower than the country's gross minimum wage.

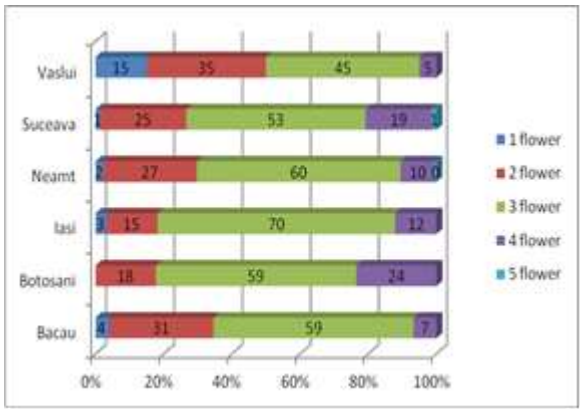

Fig. 5. Share of tourist pensions, after classification
Source: Data processing from the Ministry of Tourism database (www.turism.gov.ro) [7].

Table 4. The situation of the tourist pensions, according to the form of organization, on 31.12.2017

Category	Bacau	Botosani	Iasi	Neamt	Suceava	Vaslui	N-E Zone
Individual enterprise	19	3	10	52	15 1	5	**240**
Authorized person (PFA)	5		5	22	44		**76**
Associations and foundations			1	3	6		**10**
Limited liability company (SRL)	76	1 4	50	14 0	23 2	15	**527**
Corporation (SA)				2	7		**9**
Autonomous administration					3		**3**
Museu	4						**4**
Total	**10 4**	**1 7**	**66**	**21 9**	**44 3**	**20**	**869**

Source: Data processing from the Ministry of Tourism database (www.turism.gov.ro) [7].

Regarding the other forms of organization (limited liability company, joint-stock company), according to the turnover, they pay either a turnover tax of 1% (if the turnover is less than 1 million Euros) or the specific tax for those businesses in tourism with a turnover of more than 1 million Euros.
Thus, out of the total of 869 tourist and agrotourist boarding houses, 61% are companies with limited liability, 27% are individual enterprises, 8% are authorized natural persons, while other forms of organization hold less than 1%.

Table 5. Festivals and artistic events

County	Events
Bacau	The Plateau Festival - Oituz; Sanzii Holiday - Bacau Winter Festival of Bacau - Bacau County International Nava Art Camp - Berzunti International Fine Art Festival - Tescani
Botosani	Flamengo Mountain - Flamanzi The feasts of the forest - Vorona The Humor Festival - Botosani
Iasi	National Festival "Rose from Moldova" - Strunga Festival "Winter customs and customs" - Iasi; The fair of the craftsmen "Cucuteni 5000" - Iasi; Flower Festival of Cherry - Iasi
Neamt	International Folklore Festival "Ceahlaul" - Neamt; Parade of customs and traditions of the New Year - Targu Neamt Serbarile sneezing -Neamt Hanus Festival - Hanul Ancutei; Festival of Fruits - Piatra Neamt Serbian Camping "Silver Forest" -Agapia Bear Festival - Piatra Neamt Fair of Crafts and Tourism - Neamt Theater Festival from Piatra - Neamt Days "Ion Creanga" - Targu Neamt
Suceava	International Folklore Festival "Arcanul" Mount Forasti National Festival of Ovalor Incondeiate - Ciocanesti Folk Festival of Acacia - Arbore The Flowers Festival of Bucovina - Vatra Moldovitei National Fair of Olari Crafts - Peacock Eye - Radauti "Flowers of Dorna" Festival - Poiana Stampei "La hora satului" Festival - Fundu Moldovei The Fair of Folk Craftsmen - Falticeni International Folklore Festival "Bucovina Meetings" - Campulung Moldovenesc National Trout Festival - Ciocanesti Festival of fruits and mushrooms - Sucevita Celebrating the Hrib - Customs Autumn Poienarilor - Poiana Stampei
Vaslui	International Festival " Mount of the Elders " Village Celebration on the Racovei Valley The Vaslui flute Flower Festival on Prut - Vetrisoara The humor festival - Vaslui

Source: Own results.

The analysis shows that although the North-East region is quite well represented in terms of the number of tourist and agrotourist pensions existing at the level of Romania, there is still potential for development in this area, especially due to the multiple

possibilities of capitalizing on the local potential.

In the area there are many artistic events and traditional folk celebrations organized throughout the year that bring to the attention of the public the living, authentic spirit of the region, through the popular harbor, songs and dances, ancient customs (Table 5).

The leisure offer in rural tourism and agritourism is well represented in the counties of the North-East region and involves the organization of pedestrian hikes, cycling, riding, fishing and hunting, visits to tents, tasting products specific to peasant cuisine, organizing festivals geographic areas specific to trout, salsa, cheese, wine, etc.

A successful example is the "National Trout Festival" that takes place in the commune of Ciocanesti, Suceava county, where activities such as: rafting, traditional occupation in the area, as well as extreme sports demonstrations, rafting, bow, fishing competitions, gastronomy, but also parades of the popular harbour, riders, carts.

Another example is the "Plateau Festival", organized by ANTREC Branch in Bacau in various rural areas of the county, which combines the traditional Moldovan gastronomic presentation, ecological products and traditional handicraft art with folk performances and parades of the popular harbor.

Eco-tourism can also be developed in the North-East Region, which owns over 1,500 ha of forest, fauna and flora reserves, as well as monuments of nature specific to the mountain sector.

CONCLUSIONS

The North-East Region is one of Romania's best-represented areas for rural tourism and agritourism. The advantages of these forms of tourism are low costs compared to other forms of vacation, the originality of travel, the absence of agglomeration, intimacy, the stimulation of the economy of rural areas, the creation of new jobs, especially for women, the incomes from using the surplus of agricultural products, traditional gastronomy, environmental protection and preservation of traditions.

These forms of tourism militate for the development of the Romanian rural tourism, for encouraging the ecological preservation and preserving the traditional Romanian culture and which, through a good relationship with small rural entrepreneurs, can promote a quality rural tourism that highlights the traditional characteristics of the each ethnographic region

Although well represented, tourism and agritourism can be further developed, but they also face numerous problems that hinder their development.

One of the problems faced by those arriving by plane in the North-East Region is that the three airports in the region do not benefit from public transport lines connecting the airport and the city center of which they belong.

Another issue related to the tourism promotion is related to the organized public transport to the important tourist attractions, and in the situation where it exists, there is not enough promotion of the tourist objectives. Road infrastructure, railways are another aspect that does not come to support tourists and to encourage travel in this area.

However, we think that important steps have been taken in this directive and that if the Romanian tourist pensions would benefit from the appropriate promotion, then the number of tourists, both Romanians and foreigners, would increase.

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THE FEATURES OF THE FORMATION AND DEVELOPMENT OF AGRICULTURAL LAND MARKET IN UKRAINE

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Abstract

One has determined that the successful formation and development of the market of agricultural lands depends on a combination of various factors, taking into consideration the successful development of the agrarian sector of the economy as a whole. One has considered all external and internal factors affecting the development of the market of agricultural lands. One has systematized these factors into four large groups: environmental, economic, social and legal ones. Ecological factors include the composition and type of soil, the level of contamination and the land user's environmental policy. Economic factors affect the price of land plot depending on its size and form, geographical location of the land plot, competition on the market and infrastructure development. The social group includes all factors that are in some ways connected with the social sphere. Legal factors are related to the relationship of the state, economic entities, and the population. One has revealed that the major component of the conceptual essence of the market is a market mechanism, which is a method of interaction between the seller and the buyer, based on demand, supply and price. One has substantiated that the long-term lease of agricultural lands will be the instrument of effective market development.

Key words**:** *lands market, moratorium on agricultural lands sale, land lease, lands valuation, methods of land plots valuation*

INTRODUCTION

The formation of the agricultural land market in Ukraine is an important process for a balanced development of the country, which will affect not only economic but also environmental and social indicators. The ambiguity of the position of the authorities regarding this issue (the intention to sell about 1 million hectares of land of state ownership and the simultaneous extension of the moratorium on land sales by January 1, 2020 [9], which contradicts Article 90 of the Land Code of Ukraine [7]) only emphasizes the need for the formation and proper development of the market of agricultural lands in Ukraine. The most essential criteria for the functioning of this market should be justice, transparency, and objectivity.

A significant problem of the present is the low level of people's trust in the government. The high level of corruption has contributed to the development of psychological preconditions in the minds of the population that the creation of a land market will lead to indispensable shadow embezzlement of the largest Ukrainian national wealth – agricultural lands. In turn, it will further strengthen the polarization of Ukrainian people's incomes. That is, the successful formation and development of the market of agricultural lands depend on a combination of various factors, taking into consideration the successful development of the agrarian sector of the economy as a whole.

O. Hutorova [6], O. Hnatkovych [5], D. Dobriak [1], Y. Dorosh [2], A. Martyn [10], M. Stupen [12], M. Fedorova [3] paid special attention to problems related to the reformation of land relations and the formation of the market of agricultural land in their publications in the course of land reform in Ukraine.

However, one has not sufficiently studied many aspects of the functioning of the agricultural lands market. One can explain it not only by the multifaceted approach to the studied issue but also by the disclosure of new factors affecting the development of the land

market, which requires additional systematic research.

MATERIALS AND METHODS

The methodological basis of the research consists of a dialectical method of cognition, a systematic approach to the study of economic phenomena and processes, scientific and theoretical developments of Ukrainian and foreign scientists on the problems of the formation and development of the land market.

We are faced with the task of proposing mechanisms to form an efficient land market that properly performs its crucial functions.

One has applied some methods to realize the goal and to solve the problems of the research. They are the following ones: monographic (when developing scientific publications on land market issues); system and functional (one has generalized theoretical and methodological aspects of the study of land relations, and determined factors influencing the development of the market of agricultural land, and studied the method of determination of the value of land plots).

RESULTS AND DISCUSSIONS

First of all, we must consider all external and internal factors affecting the development of the market of agricultural lands in order to fulfill our task. In our opinion, it is appropriate to systematize these factors into four large groups: environmental, economic, social and legal (Fig. 1).

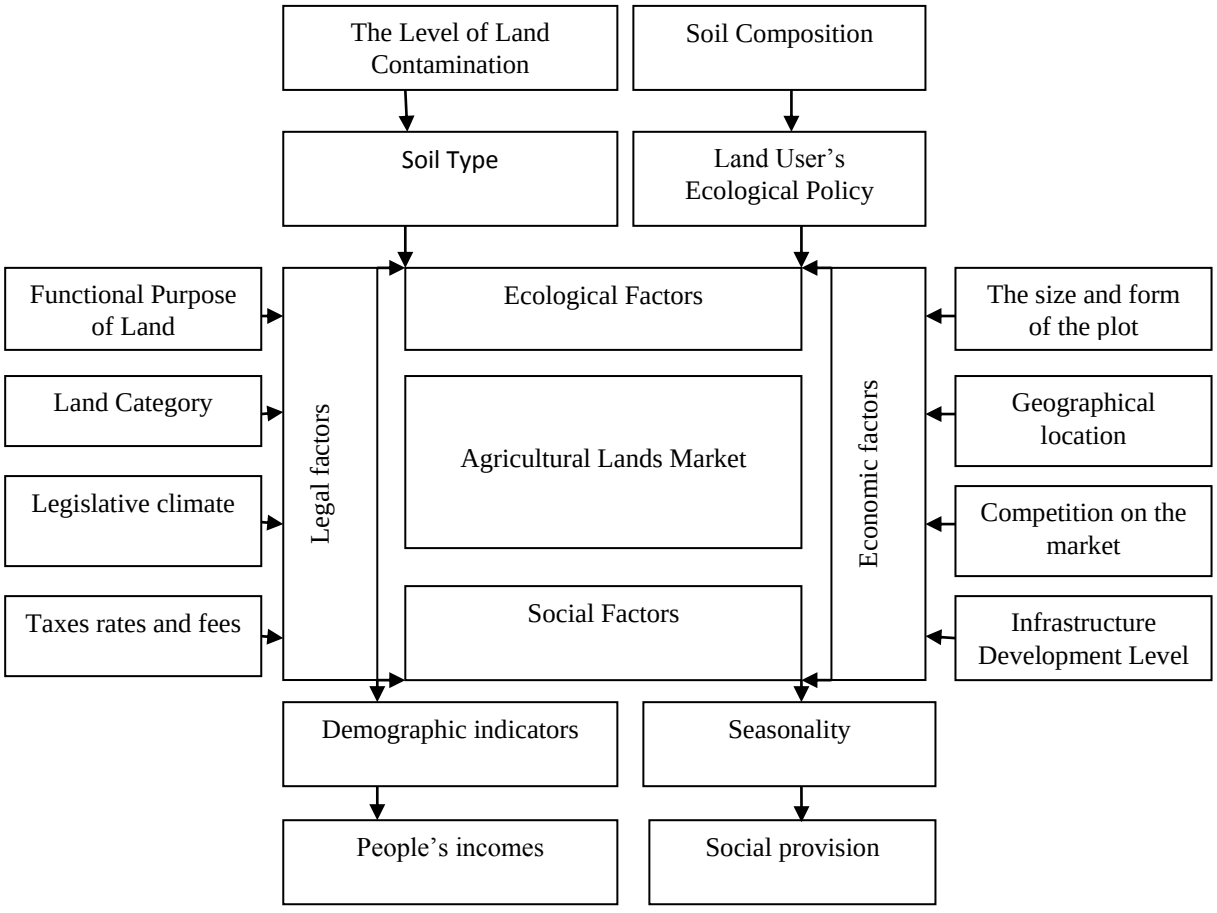

Fig. 1. Factors that influence the development of agricultural lands market in Ukraine.
Source: it is done by the author.

Ecological factors. This group includes all factors that have an ecological component. The composition and type of soil, the level of contamination and the environmental policy of the land user influence the level of demand and supply according to a particular land plot. Accordingly, one should pay more attention to such factors as contamination levels and land

user's policies. Two of these factors can be interpreted as the quality of the land before its use and the quality of the land after its use.

An essential factor in the formation of the price of land plot is the fact that when properly treated with land resources, they do not lose their value, as it happens with other material means of production. Despite this fact, there is a problem of land reclamation in Ukraine, because the owner or user of which is not able or does not see economic expediency in conducting reclamation works. Economic expediency of purification of contaminated lands can be done by the state, using financial incentive instruments. If land user's economic activity leads to deterioration of the soils, and since it concerns agricultural lands, it is impossible to avoid deterioration of the soil, then the environmental policy of the user will have a significant impact on the formation of the level of demand and supply on agricultural lands.

Economic factors. We consider that it is appropriate one can include those factors that directly affect the price of the land plot as one of the most important factors of influence on demand and supply to this group. Economic factors influence the land plot as a conditional unit, abstracting from the composition and type of soils or their contamination level. From an economic point of view, it is of vital importance only the amount of additional costs which will incur for land users when they use a particular land plot in their economic activity. The land user must ensure the supply of raw materials, equipment and labor to the plot, and the export of final products to storage depots in order to receive income. Thus, if the land user needs lesser additional costs or, in other words, the land plot is closer to the warehouses with the raw materials and final products, then one will observe the greater demand for this plot, and hence the higher price.

According to the Law of Ukraine "On land valuation" [8] and "Methods of expert monetary valuation of land" [11], there are several approaches to land valuation:

(i)an income approach, which means the capitalization of net income from the use of one or another land plot);

(ii)a comparative approach, which means a comparison of prices for land plots, similar in the context of indicators);

(iii)an approach to the balance of land, or an expenditure approach. The basis of this approach is the cost of accounting for land improvement.

All these approaches have their own specifics and peculiarities of the use.

The income approach is one of the best in the context of achieving the main objective of the business entity. One has determined the economic essence of such an approach by the calculation of the present value of future income, which arises in the process of this property implementation.

One has formed a comparative approach by comparing agricultural land with similar properties. This approach is based on the application of the principle of substitution, that is, the determination of land analogs. However, such lands have certain differences, which lead to a certain adjustment of these differences.

The expenditure approach is based on the recoverable value or the cost of replacing the land of the same utility by eliminating all types of deterioration. This approach is effective in the use of lands of special purpose [4].

Social factors. This group includes all factors that are in some ways connected with the social sphere, which supports economic activity with two most important components: labor resources and consumers of the final product.

In such an economically unstable time, as in Ukraine today, seasonality has a significant impact on the pricing of agricultural lands. Carrying out works necessarily depends on the temperature of the environment, the level of precipitation, humidity, etc. Under unfavorable conditions, an economic subject removes significant funds from economic turnover because of the slow process of getting income from their investments. For example, inflation was only 43.3% for the year of 2015 [1].

We divided the incomes of the population are distinguished in a separate category, since they have an influential impact on the

development of the land market and the formation of prices for land plots. They determine the percentage of potential consumers of final products directly near the land plot, which will affect, on the one hand, the cost of transportation and storage of final products, and, on the other hand, on the desire of the population to get a job. The land user should take into account that the costs of getting labor power from another region are significant. In addition, one will have to increase the payroll fund in order to encourage staff to work remotely from their place of residence.

Demographic indicators of the population include not only the general birth and mortality rates, but also the average age, life expectancy, sex ratio, the percentage of able-bodied people, the average level of education, etc. All these indicators will affect the availability of the land user to the required skilled workforce, significantly reducing future costs, unless it is necessary to equip the accommodation for staff in the sowing and harvesting periods.

Legal factors. In our opinion, one should include all factors that are related to the relationship of the state, economic entities and the population to this group.

Moreover, the state in the process of using agricultural land can act in several roles: the seller of land provided that the gradual lifting of the moratorium, which is planned by the Cabinet of Ministers of Ukraine, land user due to the creation of state-owned agricultural enterprises, whose income will be transferred to the state budget, the lessee by transferring the right to use land together with all risks, thus obtaining a rent, the controlling and stimulating body by charging fines from violators of the legislation and providing incentives for farms that practice the balanced land use, and buyer of agricultural products due to the mechanism of public procurement.

We focus only on those aspects of the state activities that affect supply and demand in the established agricultural land market and stimulate its development. The most common tool for regulating the functioning of the agricultural land market by the state is the rates of taxes and fees.

We can note that agricultural land is a commodity with a completely inelastic supply. Since the amount of land that can be sold is strictly limited, that is why the price adjustment for agricultural lands is possible only as a result of changing demand on lands. Moreover, it is necessary to separate agricultural demand and non-agricultural one.

Table 1. The quantity and area of land plots where there were transactions in the sphere of market turnover of agricultural lands by regions of Ukraine, 2016.

Regions	Sale		Heritage		Exchange		Mortgage		Lease		Emphyteusis	
	Quantity	Area, ha	Quantity	Area, ha	Quantity	Area, ha	Quantity	Area, ha	Quantity	Area, ha	Quantity	Area, ha
Vinnytsia	2,966	1,892.9	23,557	75,931.7	96	478.7	25	7.8	11,348	569,242	948	1,668.8
Volyn	17	456.1	7,194	26,118.1	824	441.1	9	12.8	16,823	100,446	7	18.2
Dnipropetrovsk	3,263	1,786.6	1,232	84,494.2	726	573.1	29	17.7	52,227	390,002	1,212	4,128.4
Donetsk	799	1,032.5	7,666	56,435.8	93	1,737.5	1	7.1	33,136	399,332	967	2,867.1
Zhytomyr	213	899.6	16,546	49,983.0	12	459.6	1	4.2	6,573	378,931	152	411.4
Transcarpathian	1.524	557.5	197	3,468.8	811	269.0	6	1.6	5,383	6,899	159	141.8
Zaporizhia	27	1,442.3	9,166	89,353.7	1,223	1,353.8	9	433.4	33,936	415,494	86	4,151.1
Ivano-Frankivsk	1,189	579.2	9,774	20,622.5	1,256	315.4	521	30.7	45,328	136,498	3	5.2
Kyiiv	13,956	5,816.8	2,723	52,931.5	4,281	2,619.9	8	7.0	79,812	495,892	818	1,716.8
Kirovohrad	228	2,613.9	1,124	117,364.0	4,177	5,577.6	2	13.8	47,886	532,615	11	4,401.8
Luhansk	339	211.5	5,271	33,458.9	78	24.0	27	7.8	25,695	269,846	74	517.6
Lviv	238	559.3	16,525	26,092.2	1,754	444.6	9	5.0	713	188,699	17	31.4
Mykolaiiv	1,629	2,337.1	1,577	48,188.0	666	1,635.5	11	1.8	38,795	352,208	342	1,718.6
Odessa	2,472	1,315.4	15,571	75,926.3	679	291.4	11	4.4	684	343,706	1,438	4,198.6
Poltava	236	760.6	18,447	114,551.9	567	240.6	11	0.5	9,149	568,087	1,664	4,827.2
Rivne	1,417	255.5	11,514	48,428.2	826	210.4	4	23.4	4,295	91,389	56	162.4
Sumy	1,923	741.8	27,895	99,712.4	516	240.8	19	20.9	93,374	462,889	1,424	2,485.1
Ternopil	818	231.1	17,662	36,219.5	858	447.5	17	22.1	9,834	330,685	71	121.9
Kharkiv	3,686	3,260.8	1,321	93,778.2	99	1,566.4	12	21.4	52,112	462,711	721	2,293.2
Kherson	13	1,825.1	873	40,037.5	1,238	2,594.5	13	4.6	38,318	308,149	33	1,279.2
Khmelnytsk	3,994	3,279.4	22,764	73,644.3	185	640.9	9	0.7	11,235	465,003	179	382.4
Cherkasy	2,256	1,570.1	1,759	74,057.1	1,446	1,522.9	3	0.8	88,167	524,475	89	2,123.5
Chernivtsi	125	359	6,635	11,480.0	1,529	527.4	3	1.3	21,713	69,282	721	564.8
Chernihiv	149	1,416.4	25,377	95,497.2	384	213.5	11	0.1	116,988	417,408	39	139.9

Source: It is formed according to the monitoring of Land Relations in Ukraine, 2016-2017.

One has given the results of the analysis of transactions according to the forms of market turnover of agricultural lands in the regional section of Ukraine for the year of 2016 in Table. 1.

Agricultural demand arises on those land plots that are suitable for the agricultural activity. It is a derivative of demand for agricultural production, which, in turn, is inelastic (that is, the volume of agricultural production will not decrease significantly with the increase of prices). Land as a commodity in the market has its own properties not only because of the total lack of substitute goods and the absolute inelasticity of the offer, but also because such inelasticity leads to "passivity" of land rent.

We propose to use the model of hedonistic prices to determine the market value of agricultural lands. One can use various factors of influence to estimate the value of agricultural lands, the choice of which, as a rule, takes place depending on the possibility of further interpretation of the results. Based on these criteria, one has chosen two functional forms for the empirical model of hedonistic research on farmlands prices in Ukraine. The first form is a standard linear econometric equation, and the second is the semi-logarithmic one. As a result, a linear econometric model for estimating regression parameters has the form:

$$PPST=\beta_0+\beta_1 SIZE+ \beta_2 BONT+ \beta_3 DFCY+ \beta_4 RPPC+ \beta_5 ATWT+ \beta_6 ATRD+u \quad (1)$$

where PPST – the price of land for the area of 100 square meters, SIZE – the size of land plot, BONT – soil quality, DFCY – distance from regional centre, RPPC – people's income and regional economic development level, ATWT – access to water, ATRD – access to the road.

The semi-logarithmic econometric model has the form:

$$\ln(PPST)= \beta_0+\beta_1 SIZE+ \beta_2 BONT+ \beta_3 DFCY+ \beta_4 RPPC+ \beta_5 ATWT+ \beta_6 ATRD+u \quad (2)$$

where ln(PPST) – natural logarithm of the price of land for the area of 100 square meters.

The increase or decrease in the price of land, and consequently the change in the size of the land rent does not affect the supply, while the change in the price of "ordinary" goods either leads to an increase in the offer, if the price increases, or producers decide to reduce the offer of some goods provided that the price is reduced.

However, in spite of the above-mentioned information, if one considers a micro level, then one may not follow the rule of absolute inelasticity of the supply. It can happen when there may be more landowners who are aiming to sell their land plots than real buyers of these land plots in a certain region. In this case, the excess supply over demand will lead to the lowering of prices for land.

One should always take into account such a property of agricultural land when forming the land market in Ukraine.

CONCLUSIONS

Until an integral market of agricultural lands in Ukraine is in the stage of formation and gradual implementation. Long-term lands leases instead of land purchase transactions occupy part of the market. And even after one lifts the moratorium partially or completely, the key to effective market development will be to improve the mechanism of lease relations, which has a number of shortcomings.

That is why the process of determining the size and reimbursement of losses when the tenant does not fulfill his lease obligations, the ongoing control over the activities of the lessee and the process of insurance of risks in the transfer of land as an asset in the lease.

One should concentrate the further development of lease land relations in the context of solving the issues of forming a competitive environment, working out mutually beneficial rules of the game between the subjects of the lease agreement, establishing the optimal size of the lease, forms of its payment, terms of lease, compliance with the parties contractual obligations, conservation and rational use of leased land, development of mechanisms for

attracting middle and long-term leases by tenants, improvement of land legislation.

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LAND AND RESOURCE POTENTIAL OF PROTECTED AREAS OF UKRAINE IN THE CONTEXT OF THE IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT STRATEGY

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Abstract

One has determined the essence, structural features, functional significance and the role of protected areas. One has revealed the concept of "land and resource potential of protected areas". One has kept under review features of the use of the land and resource potential of protected areas considering the strategic concept of sustainable development. One has determined the indicators of the quantity, the structure, the dynamics, and the distribution of object areas by categories, as well as characterized indicators of the reservation of the territory of the country. One has proved that there are positive tendencies in increasing areas of protected areas. One has indicated the necessity of capacity building by increasing the area of protected areas, which is expedient to carry out due to the transformation of disturbed, degraded and low-yield lands on the basis of re-cultivation, conservation (grassland renovation, forestation) and their transfer to separate objects of protected areas.

Key words**:** *protected territories, land and resource potential, sustainable development products, Romania*

INTRODUCTION

The strategy of sustainable development, which is a crucial concept of the contemporary worldview formation, puts the priority task of preserving natural resources and protecting the environment. At the same time, the problem the preservation of unique nature objects becomes obvious in the context of exacerbation of environmental problems associated with the use of natural resources in economic activity, the consequence of which is the violation and degradation of natural ecosystems in the significant number of areas and water areas.

The wealth of Ukraine is directly related to its considerable land and resource potential. Land resources are one of the components of the environment. Moreover, anthropogenic pressure intensively grows on those resources, especially in recent years. Considering land resources, their development is increasing, and therefore the avoidance of imbalance in the "human-environment" system and the creation of favorable conditions for their balanced use remain the urgent issues. In such a way, the increase of anthropogenic and man-made load on the environment, the violation of ecosystem regulation and self-reproduction, the extremely high level of utilization of components of nature and resource (including land and resource) potential, reduction of the agro-landscapes stability, formation of rational use and protection of lands encourages the need for research issues related to the functioning of the land and resource potential of protected areas in the context of the implementation of sustainable development strategy.

MATERIALS AND METHODS

We have applied a number of general and special methods for achieving the set goal and solving the above-mentioned tasks of scientific research. One has used methods of logical generalization and scientific abstraction in order to clarify the conceptual

apparatus of the research; methods of system analysis and synthesis, induction and deduction – to identify the regularities, features of the formation, use and development of protected areas and land and resource potential; complex analysis – to establish environmental and economic as well as social trends of the protected areas.

One has used tabular, graphical and cartographic methods for a visual illustration of the results of the study. The legislative and regulatory documents of Ukraine, official data of the State Statistics Service of Ukraine, the Ministry of Ecology and Natural Resources of Ukraine, the State Service of Ukraine for Geodesy, Cartography and Cadastre, reports of regional departments of the StateGeoCadastre, ecology and natural resources departments form the information base of the research.

Boreiko (2005), Kasperevych (2017), Reimers, Shtylmark (1978), Chernykh (2014), and others reflected various aspects of the development and functioning of the land and resource potential of protected areas in national and foreign publications [1, 4, 12, 2]. It should also be noted that today there are virtually no results of the complete systematic studies aimed at solving the problems of the functioning of the land and resource potential of protected areas in the context of implementing sustainable development strategy.

RESULTS AND DISCUSSIONS

The development of economics, construction, growth and strengthening of urbanization processes, the expansion of economic and recreational activity in natural landscapes lead to the necessity to protect and preserve the environment of stabilizing, health, and protective properties of nature, conservation for the present and future generations of areas of primitive and unchanged nature, wealth and the diversity of flora and fauna, unique and attractive natural creations that make up a nationwide and ethnic heritage. This task can be resolved only due to the creation and organization of protected areas.

The prerequisite for the creation of protected areas is also caused by the fact that at the present stage human activity is the main factor that determines the major part of the processes which take place in ecosystems. As a rule, protected areas are excluded from economic activity to some extent, and they are traditionally considered as objects that impede the economic development of the region. Meantime, these territories, which are completely or partially withdrawn from economic circulation, have a special regime of protection, which depends on the category, and is an important stabilizing mechanism of the biosphere. The territories support the ecological stability of the territory, which is substantially changed by economic activity; they impede the growth of negative processes that lead to the degradation of the biosphere; they contribute to the provision of ecosystem services; they are of vital importance in stabilizing the climate, mitigating the processes of its change; they are biological reserves, in which unique and typical natural complexes are preserved, objects of the animal and plant world, including endangered and valuable resources. Simultaneously, protected areas perform essential scientific and socio-cultural functions, being polygons for studying natural ecosystems and processes that take place in them, as well as they contribute to ecological education, educational activity and public awareness campaign of the population. In addition, there are significant recreational resources and tourism potential in these areas. Nowadays the main feature of the development of protected areas is the transition from the local nature of the impact on nature to the global one [15].

According to the International Union for Conservation of Nature (IUCN), a protected area is the territory or water area, intended for the protection and maintenance of biological diversity and natural and related cultural resources, the protection of which is established by law or by other means [10]. In accordance with the data of the International Union for Conservation of Nature, there were 209,429 security objects with a total area of about 32.9 million km² (14% of the globe and 3.41% of the World ocean) in the world in

2014 [3]. At the same time, there is considerable unevenness in the distribution of protected areas of different categories by regions of the world and countries. As a matter of fact, the distribution of protected areas and their share in the land fund are determined by a lot of factors, among which the size and natural conditions of the regions, the degree of their human development, the tradition of reserve issues, the nature protection culture of states and population, the level of social and economic development of the country, the features of the state ecological politics, etc.

Ukraine has considerable unique, diverse and attractive natural resources and conditions: water resources, forest resources, land resources, climatic conditions, landscape, and biodiversity, which allow for sustainable development. These resources are crucial in diversifying the economy of the country, and their rational use contributes to the growth of natural capital and social and economic potential of the territory.

The natural and resource potential of the country has been used inefficiently and irrationally for a long time, and as a result, depleted and degraded resources (land, forest, water ones) require urgent intervention, in particular, conservation, careful use, and thriving use and restoration. Therefore, the corresponding response to the total use of natural resources of the country is the development of the existing network of protected areas of Ukraine and the creation of new territories, which should fulfill the role of the ecological framework, and some of them form special centers that allow preserving the most valuable natural complexes in the natural state, as well as they can contribute to the successful restoration of ecosystems.

One should pay attention to the fact that from the scientific point of view the term "protected areas" is quite common, but it is not provided in the legislative norms of Ukraine. According to the current legislation of Ukraine, the term "natural territories and objects that are subject to special protection" is widely used. Thus, in accordance with the article 60 of the Law of Ukraine "On Environmental Protection" natural areas and objects to be protected, form a single territorial system and include territories and objects of nature and reserve fund, health and therapeutic, recreational, water protection, field protection and other types of territories and objects, determined by the legislation [5]. Principally, the system of territories and objects of special state protection includes the territory (water areas), which preserve almost unchanged or partially changed natural landscapes. They are protected as a national heritage and at the same time as a component of the world system of natural territories and objects under special protection.

In our opinion, the term *"protected areas"* should be identified with the term "natural territories and objects subject to special protection". Therefore, nature reserves (water areas), which are allocated for the purpose of environmental protection, for which clearly defined, regulated forms and methods of using natural resources and conducting economic activity, should be included in the protected areas. Consequently, nature protection areas include natural areas and objects subject to special protection, as well as various protective, buffer and other zones, urban forest areas, suburban green zones, the legal regime of which is fixed in the land, water, forest, and town-planning legislation. In this case, we state that protected areas should be included in the system of rational nature use and interact not only among themselves but also with exploited territories. Furthermore, they perform the environment stabilizing, protective, and resource-saving and other functions that represent a unified functional system.

Thus, the above-described structural features of protected areas allow us asserting that we consider nature protection areas not only as a category of land but rather as a qualitative category that reflects the purpose of assigning a specific area (territory, its part) for environmental protection, conservation, resource conservation, restoration goals. In this regard, it one should take into account that protected areas can be located in almost all categories of land provided for by the Land Code of Ukraine.

Summing up the above-mentioned issues we state that "land and resource potential of the protected area" is a set of available land and other related resources and conditions, quantitative and qualitative opportunities of the natural territories (water areas) allocated for the purpose of environmental protection, for which there are clearly regulated forms and methods of land use, have clear limits and legal status and are intended for the protection of the environment.

Land resources always play a key role in the current social and economic development of society. As part of the natural resource potential of Ukraine, land and resource potential is 44.7 percent of the total value [9]. One has characterized the land and resource potential by the presence of high bio-productive potential, and fertile black soils predominate in its structure. Thus, the averagely weighted land provision of the major sectors of the economic complex is sufficient for their normal development and functioning. Meantime, the existing systems of agricultural and environmental land use deplete natural potential. The high demand for land use changes often results in deforestation and loss of biodiversity.

Based on the analysis of the state of land and resource potential of Ukraine, it does not fully meet the requirements of rational nature use management. Land resources of Ukraine (60,354.9 thousand hectares) are characterized by an extremely high level of development; more than 92% of its territory is included in economic use [7]. Investment returns of land and resource potential and contribution to accelerating social and economic development remain unsatisfactory. In Ukraine, there is an unbalanced structure of land use and management, which is generally ineffective and environmentally hazardous. Thus, considering their economic use, an estimation of the distribution of land resources of Ukraine shows that the largest share belongs to agriculture – 69.8%, forestry takes the second place – 14.7%, environmental protection – the third one (4.8%) and other and unused lands – 5.4% (Table 1).

Table 1. An estimation of the distribution of land resources considering their economic use

№	Types of economic use of lands	Total area		including		
		thousand hectares	%	arable lands	under construction	Ecologically-stabilizing lands
1	Agriculture	42,131.0	69.8	32,173.4	1,162.0	8,795.6
2	Residential and other buildings	987.1	1.6	59.8	576.0	351.3
2.1	including for waste disposal	16.5	0			
3	Forestry	8,868.4	14.7	1,079.1	791.7	6,997.6
4	Water resource management	243.7	0.4	1.6	28.8	213.5
5	Defense industry and other ones	1,653.7	2.7	223.2	968.0	462.5
5.1	including industries for the development of mineral deposits, borrow pits	157.1	0.3			
6	Environmental protection	2,909.8	4.8	1.0	1.5	2,907.3
7	Human health protection	160.9	0.3	3.2	47.4	110.3
8	Culture, spirituality, etc.	170.8	0.3	42.2	69.4	59.2
9	Not used and other lands	3,229.3	5.4	1,044.1	777.2	1,408.0
	Total:	**60,354.9**	**100.0**	**34,627.6**	**4,422.0**	**21,305.3**
	% of the total area	**x**	**x**	**57.4**	**7.3**	**35.3**

Source: It is calculated according to the data from [7].

In Ukraine, lands are differentiated according to the categories that are allocated for the main purpose and have a certain legal status (Table 2). Thus, agricultural lands occupy the largest share – 70.0%. The lands of forestry make up 14.9%. The category of lands of nature and reservation as well as nature and conservation purposes is only 4.8%.

Table 2. The distribution of lands according to categories

Categories of lands	Area	
	thousand hectares	%
Agricultural lands	42,228.2	70.0
Land for residential and public construction	1,559.0	2.6
Lands of nature and reservation as well as nature and conservation purposes	2,906.8	4.8
Lands for recreational purposes	27.5	0
Lands for health purposes	109.9	0.2
Lands of historical and cultural purposes	53.2	0.1
Lands for forestry purposes	9,028.3	14.9
Earth Water Fund	3,255.0	5.4
Lands of industry, transport, communication, energy, defense and other purposes	1,187.0	2.0
Total area	60,354.9	100

Source: It is calculated according to data [7].

Unfortunately, the current state of Ukrainian natural landscapes only partially meets the criteria for attributing them to the Pan-European Ecological Network [11]. As a whole, according to the National Report of Ukraine on the harmonization of the society life in the environment, prepared for the 5th All-European Conference of Ministers of the Environment "Environment for Europe", natural landscapes exist on almost 40 percent of the territory of Ukraine. They have been preserved in the least altered form on lands which are occupied by forests, shrubs, swamps, and open lands, the area of which is 19.65% of the territory of the country. Taking into consideration that only 44 percent of forests perform protective and environmental and security functions, there are reasons to believe that the state of landscapes, which is close to the nature, have 12.7 percent of the country's territory [6]. At the same time, the consequences of irrational use of land resources in the past, namely an extensive land use, a neglect of environmental justification in the process of development of the agro-industrial complex, a regulation of river flow, a drainage of swamps, a spontaneous development of collective gardening and other disorderly actions led to the destruction of almost 70 percent of valuable lands, natural complexes and landscapes of Ukraine.

Today, the paradigm of sustainable development, environmental security, conservation of biological and landscape diversity has never been a priority. However, the compliance with environmental directives and, in particular, the conservation and restoration of biodiversity is one of the prerequisites for full membership in the context of the Association Agreement between Ukraine and the European Union.

So, our country occupies 6% of the European area and owns more than 35 percent of its biodiversity. In our territory, we protect 70-90% of the endangered and rare species of flora and fauna, which are listed on the European Red List. Most migration routes and environmental corridors pass through Ukraine [13]. Therefore, only creating ecologically and biologically stable and representative networks of protected areas can stop the rate of loss of biological diversity in the transition to sustainable development of society. Their role in this process is principal and fundamental.

Thus, the natural reserve fund predominates within the protected areas. The structure of the nature reserve fund of Ukraine includes all 11 categories of territories and objects of national and local significance. According to data of the Ministry of Environment and Natural Resources of Ukraine, 5 biosphere reserves, 19 nature reserves, 49 national natural parks, 3,168 reserves, 3,441 natural monuments, 81 regional landscape parks, and 812 protected natural boundaries as well as a number of artificial objects (botanical gardens, zoological parks, arboreta and parks of monuments of garden design) – only 8,245 territories and objects with the total area of 4,318.2 million hectares, which was 6.6% of the territory of the country, and 1 marine

botanical reserve of the national value "Phyllophora field of Zernova" with an area of 402.5 thousand hectares were included in the territories and objects of the nature reserve fund of Ukraine as of January 01, 2017. So, the natural monuments, reserves and protected natural boundaries (about 90% of the total number of existing objects) had the largest share of them. Over 85.5% of the natural reserve fund was allocated to nature reserves, national natural and regional landscape parks made the largest share [14].

There were 663 territories and objects of the natural reserve fund of national importance: 19 natural and 5 biosphere reserves, 49 national natural parks, 320 reserves, 136 natural monuments, 18 botanical gardens, 7 zoological parks, 20 arboreta, 89 parks-monuments of garden design in Ukraine, as of 01.01.2017. Their total area was 2,477.1 thousand hectares (within the territory of Ukraine) or 57.36% of the total area of the natural reserve fund and 4.10% of the area of Ukraine. The number of territories and objects of the natural reserve fund of local significance was 7,582 units with an area of 1.841 million hectares [14].

The share of areas of territories and objects of certain categories in the natural reserve fund was: natural reserves – 4.79%, biosphere reserves – 11.09%, national natural parks – 30.37%, reserves – 32.18%, natural monuments – 0.69%, regional landscape parks – 18.2%, reserves – 2.26%, botanical gardens – 0.05%, zoological parks – 0.01%, arboreta – 0.05%, parks of monuments of garden design – 0.31% [14].

The indicator of the reservation varies considerably in the regions of the country (Fig. 1). Thus, it is the smallest (up to 5%) is in the regions of Vinnytsia, Dnipro, Donetsk, Zhytomyr, Zaporizhia, Kyiv, Kropyvnytskyi, Luhansk, Mykolaiiv, Odessa, Poltava, Cherkasy, Kharkiv, and the largest one (more than 12 %) in the regions of Ivano-Frankivsk, Khmelnytskyi, Transcarpathian and Chernivtsi, while it is 14.9% and 30.3 % in Kyiv and Sevastopol respectively. To add more, it is 6-12 % in Volyn, Lviv, Rivne, Sumy, Ternopil, Kherson, Chernihiv regions and the Autonomous Republic of Crimea. Thus, the indicator of the reservation ranges from 2.24 to 15.71 % in the various regions of Ukraine.

Fig. 1. The indicator of the reservation of regions of Ukraine
Source: made by author based on the data from [14].

In general, one can state that the reserve case got its "Renaissance" in the first decade of the independence of Ukraine. Recognizing this important environmental field as one of the main priorities of state policy, the reserve fund has more than doubled, and at the same time, the legal framework for the further development of the reserve case is laid down. So, according to the State Statistics Service the dynamics of the increase of the areas of reserves and natural national parks of the years 1990-2017 shows positive trends in increasing their areas almost in three times (by 1,590.4 thousand hectares) (Fig. 2). Actually, this network of reserve areas of the country is not only a national heritage but also an integral part of the European and world nature conservation network.

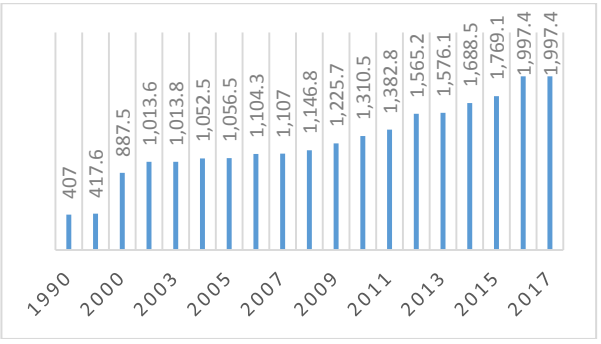

Fig. 2. The dynamics of the areas of reserves and natural national parks of the years 1990-2017, thousand ha
Source: made by author based on the data from [8].

Herewith one should pay regard to the fact that the area of protected areas per one resident of Ukraine is only 570 square meters in comparison to 2,220 square meters in Europe. According to the Law of Ukraine "On the main principles (strategy) of the national environmental policy of Ukraine for the period until the year 2020", the expansion of the protected area of the nature reserve fund should reach 15 percent of the territory of Ukraine until the year 2020. Compliance with the requirements of this Law as well as the State Strategy for Regional Development for the period up to 2020 is extremely important, since now the indicator of protected areas in Ukraine is almost lower in three times than the average one in Europe, and for comparison, the area of unauthorized dumps exceeds the territories of nature reserve fund [13]. We state that it is expedient to increase the area of protected areas due to the transformation of disturbed, degraded and low-yield lands on the basis of re-cultivation, conservation (grassland renovation, forestation) and their transfer to separate objects of protected areas.

Global sustainable development goals were approved by the United Nations Summit on Sustainable Development in 2015. Markedly, 17 sustainable development goals and 169 targets were approved in the document of the Summit "Transforming our World: the 2030 Agenda for Sustainable Development". Ukraine, like other UN member states, has joined the global process of sustainable development. An inclusive process of adaptation of sustainable development goals was initiated in order to establish a strategic framework for national development of Ukraine for the period up to the year 2030 on the basis of the principle of "Do not leave anyone aside". One considered each global goal considering the specifics of the national development.

CONCLUSIONS

All in all, sustainable development of any territorial social and economic system can not be considered without the functioning of protected areas. We declare that balanced land and resource potential is optimizing its structure to environmentally sound borders. Therefore, the current crisis phenomena that take place at the present stage of using the land and resource potential of the protected areas imply the extremely necessary implementation of the 15 sustainable development goals: "To preserve and restore the ecosystems of lands and to promote the rational use of these ecosystems and forests, to combat desertification, to stop and to turn back the process of degradation of lands and to cease the process of biodiversity loss" [8]. The following tasks are set in the context of this goals: to ensure the conservation of the restoration and sustainable use of ground and inland freshwater ecosystems; to promote sustainable forest management; to restore degraded lands and soils using innovative technologies; to ensure the conservation of mountain ecosystems. Thus, the implementation of a sustainable development strategy is a kind of "projection of the future" with a clear set of actions for achieving the set goals.

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THE METHODOLOGICAL APPROACHES TO THE ASSESSMENT OF THE ECONOMIC EFFICIENCY LEVEL OF AGRICULTURAL LANDS USE OF THE REGION

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Abstract

The study of the issue of the effective use of lands is carried out using the calculation of economic indicators, on the basis of which a general rating has been determined and a cluster analysis has been carried out. The methodical instrument for constructing cluster analysis was the method of complete linkage at the Euclidian distance to combine the most similar administrative districts of Lviv region according to standardized indicators of economic efficiency of agricultural lands use. The article presents the results of cluster analysis, which showed the formation of three clusters in terms of economic efficiency of agricultural lands use in Lviv region. The research confirms empirically that the condition of land resources in Skole and Turka districts of Lviv region is unsatisfactory. Sambir and Horodok districts are defined as areas with a satisfactory state of agricultural land. In other districts of the region, we can witness a good state of land for the production of agricultural products. The results of the conducted research may be useful for the unification of business entities on an innovative basis to achieve competitive advantages and support economic growth at the regional level.

Key words**:** *agricultural lands, cluster analysis, efficient lands use, assessment, region.*

INTRODUCTION

In Ukraine, due to the transformational processes of land relations development, the problems related to the assessment of land use efficiency in market conditions of the economy remain unresolved. The issue of improving the economic efficiency of agricultural lands use, forming a land market, recognizing the land as commodity and capital, determining its market value are extremely relevant.

Under the current conditions of economic activity, the reduction of the efficiency of agrarian production and living standards of the population, the assessment of the economic potential of the regions is not sufficiently studied and requires the improvement of methodological approaches to address the problems of the efficiency of land use in the region and management.

Such scholars as V. Andriichuk [1], Y. Dorosh [2], O. Hutorov [3], Z Ryzhok [8], A. Tretiak [9], O. Ulianchenko [10], and others made an analytical analysis of the issues decision on the organization of land resources efficient use under conditions of their reproduction and protection due to administrative and managerial decisions at the present stage of implementation of land reform, the formation of a market economy. They examined theoretical and methodological approaches to improving the land use management system.

However, in the framework of socio-economic development of the regions mechanisms for the regulation and land resources use of administrative and territorial entities require further scientific development and substantiation in order to preserve the land potential and to form effective mechanisms for preserving the productivity of the land, raising the level of the population welfare.

MATERIALS AND METHODS

The concept of the effective use of land potential in the regions has a practical need and expediency and should be based on new innovative principles and methodological approaches. Therefore, we have the task of studying the level of economic efficiency of land use on the example of Lviv region. The methodology for calculating the system of indicators for assessing the economic efficiency of land resources use is presented in Table 1.

Table 1. The methodology for calculating the system of indicators for assessing the economic efficiency of land resources use

	Indicators	Formula for calculation	Content
Economic	Production of gross agricultural products GDP	GDP = GDPp + GDP$_l$ (1) where GDPp – products of some industries of plant growing, a GDP$_l$ – livestock in cash for a certain period (as a rule, per calendar year), UAH.	characterizes the total amount of agricultural production and represents the full cost of the manufactured product
	Income from the sale of agricultural products I	I = S – C (2) where S − the volume of sales of agricultural products, C - its full cost	is the purpose of entrepreneurship and the main economic indicator
	Profitability from the sale of agricultural products P	$P = \frac{ц0 - c}{c}$ (3) where P – price of agricultural products sales, UAH/p; V - volume, p; C - cost of production, UAH	provides an objective assessment of the efficiency of agricultural enterprises
	Cost price of production of agricultural products C	$C = \sum B$ (4) where E – expenditures on production of agricultural products in cash, UAH	is the basis for determining prices for agricultural products

Source: It is done by the author on the basis of [1, 7]

To identify regional features state of agriculture conducted a hierarchical cluster analysis using the complete linkage method at the Euclidian distance. It defines the distance between the clusters as the greatest distance between any of the most distant two objects (x_i and y_i) in different clusters. The proximity measure, which is determined by the Euclidean distance, is a geometric distance in the n-dimensional space, which is calculated as [6]:

$$d(x, y) = \sqrt{\sum_{i=1}^{n}(x_i - y_i)^2}$$

RESULTS AND DISCUSSIONS

Furthermore, we believe that in assessing the efficiency of agricultural lands use, an increase in the volume of agricultural production, that is, income from the land use, subject to compliance with environmental requirements of land use and increase of soil fertility, should be an indicator. Therefore, in the analysis of efficiency, it is necessary to take into account indicators of assessment of the land use efficiency using economic indicators, determined on the basis of modern factual data.

In assessing the economic potential of land resources, the following indicators were taken into account, such as profit – 1,299,338 thousand UAH and the profitability from the sale of agricultural products – 31.7%, the cost of production of 1 c of grain and legume crops – 245.97 UAH. Economic indicators have been used to determine the rating assessment of the efficiency of land use (Table 2). According to them, Brody district receives the best general assessment, and Skole district is the worst one.

The level of land use efficiency determines the yield of gross output per hectare of agricultural land. In total, in Lviv region, gross agricultural output per person is 2,282 UAH, per 100 hectares – 757.4 thousand UAH. The indicator of gross agricultural production is partial and, consequently, may vary depending on the spatial aspect, the time range, under the influence of organizational, economic and innovative mechanisms and, as a result, subject to increase as a result of the ecological and economic formation of sustainable land use in the region.

Among the reasons for low-cost use of land are:

- imbalance of the structure of landscapes and agricultural lands, a high degree of plowing, which reduces their buffer properties and makes it very vulnerable to any external factors of influence: climatic, man-made, etc.;
- application of low-efficiency unbalanced agricultural systems;
- low fertilizer and pesticide culture;
- low crop yielding capacity;
- low export price of agricultural products [4].

An important step is to determine the indicators of economic potential of land resources of regions at the present stage of formation of a regional economy. In turn, the economic potential depends directly on the effective use of land, the development and structure of the agricultural production industry in a particular territory.

Table 2. Assessment of efficiency of agricultural lands use according to economic indicators in Lviv region, 2017

Administrative district	Economic indicators								Total rating
	Production of gross agricultural products per 100 hectares of agricultural lands, thousand UAH GDP		Income from the sale of agricultural products, ths. UAH I		Profitability from agricultural products sales, % P		Cost of production of 1 c of grain and legume crops, UAH C		
	value	rating	value	Rating	value	rating	value	rating	
Brody	751.8	9	141,466.5	3	46.6	5	162.56	1	1
Busk	661.5	16	87,640.0	7	19.5	14	294.69	17	16
Horodok	769.8	7	109,281.2	6	127.2	1	265.48	13	4
Drohobych	844.9	5	3,186.6	16	9.3	16	204.69	3	10
Zhydachiv	637.2	18	126,551.3	5	33.8	7	245.44	9	9
Zhovkva	904.0	3	28,159.1	12	49.2	4	255.37	10	5
Zolochiv	1,166.0	1	45,696.5	11	30.0	10	242.39	7	6
Kamianka-Buzka	637.9	17	152,872.9	2	20.2	13	279.87	15	14
Mykolaiiv	883.7	4	5,087.9	15	5.6	17	232.51	5	13
Mostyska	735.6	11	20,089.2	13	14.9	15	300.67	18	17
Peremyshliany	799.3	6	67,251.9	9	54.8	3	240.26	6	17
Pustomyty	1,143.1	2	67,477.3	8	38.4	6	195.01	2	2
Radekhiv	764.9	8	236,782.1	1	24.8	11	255.72	11	7
Sambir	509.2	20	5,491.1	14	72.1	2	279.45	14	14
Skole	519.3	19	-	19	-	19	-	19	20
Sokal	743.0	10	63,862.7	10	31.7	8	226.91	4	8
Staryi Sambir	687.5	13	662.0	18	22.7	12	244.24	8	15
Stryi	673.3	15	136,381.5	4	31.4	9	264.22	12	11
Turka	732.3	12	-	20	-	20	-	20	19
Yavoriv	683.6	14	1,397.9	17	2.3	18	282.47	16	18
Lviv region	*757.4*		*1,299,338*		*31.7*		*245.97*		

Source: Own calculation based on the data from [5].

Hierarchical cluster analysis was conducted on the basis of economic indicators of the efficiency of agricultural lands use for identifying regional features of the agricultural production in Lviv region. Creation of cluster formations based on economic indicators in Lviv region will allow uniting business entities on an innovative basis to achieve competitive advantages and support economic growth at the regional level. In addition, cluster analysis was performed on the basis of the data shown in Table 2.

Table 3. Standardized indicators of economic efficiency of agricultural lands use in Lviv region, 2017

Administrative district	Economic indicators			
	Production of gross agricultural products per 100 hectares of agricultural lands	Income from the sale of agricultural products	Profitability from agricultural products sales	Cost of production of 1 c of grain and legume crops
Brody	-0.06301	1.13852	0.50301	-0.73034
Busk	-0.60001	0.33744	-0.41340	0.85065
Horodok	0.04404	0.65952	3.22856	0.50114
Drohobych	0.49064	-0.91946	-0.75832	-0.22624
Zhydachiv	-0.74452	0.91654	0.07017	0.26135
Zhovkva	0.84210	-0.54780	0.59093	0.38017
Zolochiv	2.40018	-0.28680	-0.05833	0.22486
Kamianka-Buzka	-0.74035	1.30828	-0.38973	0.67332
Mykolaiiv	0.72138	-0.89116	-0.88344	0.10664
Mostyska	-0.15935	-0.66790	-0.56895	0.92220
Peremyshliany	0.21947	0.03401	0.78030	0.19937
Pustomyty	2.26400	0.03736	0.22572	-0.34206
Radekhiv	0.01490	2.55708	-0.23417	0.38436
Sambir	-1.50571	-0.88516	1.36531	0.66830
Skole	-1.44565	-0.96688	-1.07280	-2.67544
Sokal	-0.11534	-0.01643	-0.00085	0.03964
Staryi Sambir	-0.44539	-0.95703	-0.30519	0.24700
Stryi	-0.52983	1.06284	-0.01099	0.48606
Turka	-0.17897	-0.96688	-1.07280	-2.67544
Yavoriv	-0.46858	-0.94608	-0.99503	0.70443

Source: Own calculation on the basis of data [5].

The data from Table 2 characterized the efficiency of land use in agricultural enterprises of Lviv region for 2017, taking into account the scale of distances between clusters.

Based on these date, the standardized indicators of economic efficiency were calculated and presented in Table 3.

Cluster territorial and industry development of agriculture will promote its innovative modernization, the increase of human capital, the improvement of the quality of agrarian products and balance of the obtained industrial results considering economic, social and ecological coordinates [11].

In Fig. 1 shows the vertical dendrogram of cluster analysis performed in the program Statistica using the complete linkage method at the Euclidean distance to combine the most similar administrative districts of the region according to standardized indicators of economic efficiency of agricultural lands use.

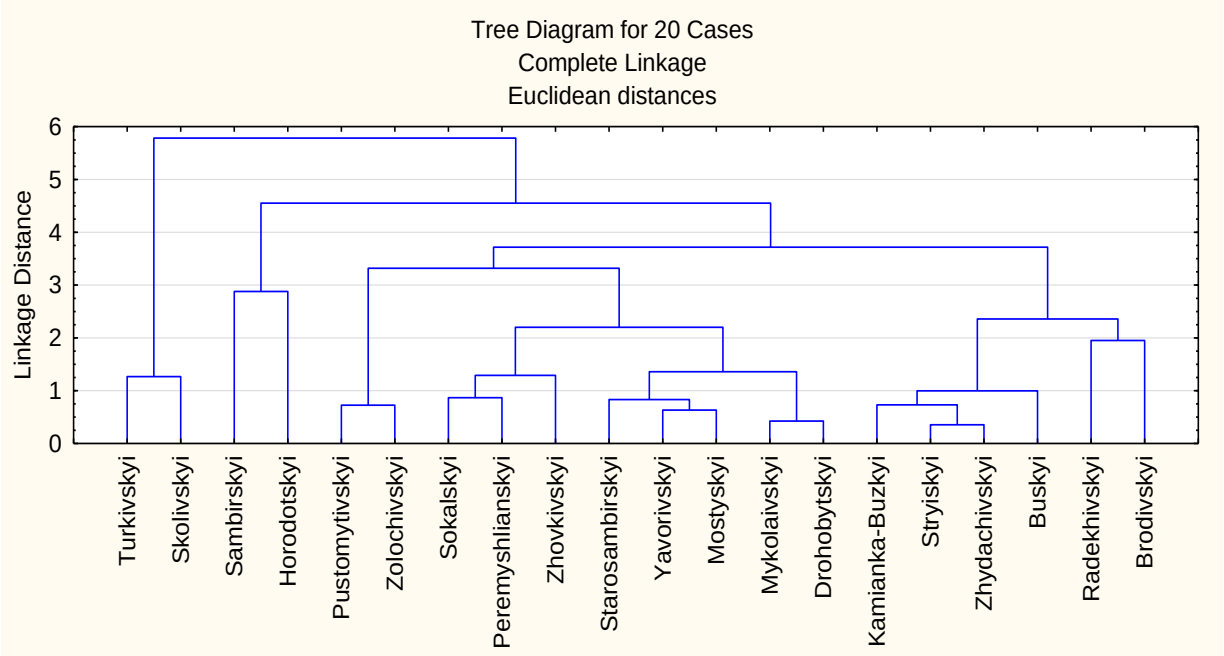

Fig. 1. Vertical dendrogram of cluster analysis according to standardized indicators of economic efficiency of agricultural lands use in Lviv region, 2017.

Source: It is done by the authors on the basis of [5].

The number of clusters is shown on the graph using the k-medium method using the indicators of economic efficiency of agricultural lands use in Lviv region (Fig. 2).

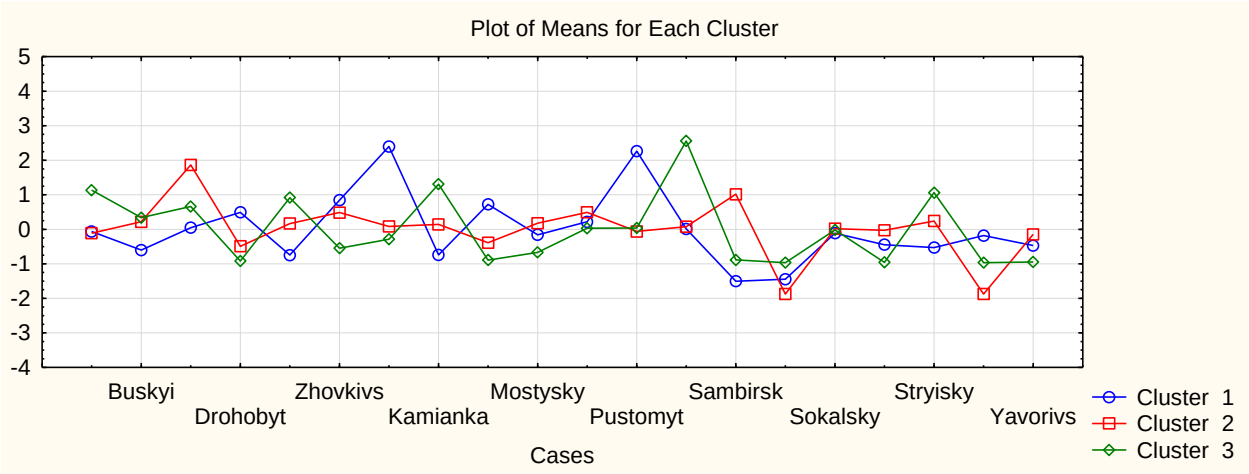

Fig. 2. The Schedule of average values for clusters according to the indicators of economic efficiency of agricultural lands use in Lviv region, 2017.

Source: It is done by the authors on the basis of [5].

In Table 4 the differences between the received clusters, namely the analysis of the deviations obtained using the dispersion analysis are shown. And also the distances between objects of the cluster, which allows you to display the Euclidean distances of objects from the center, that is, the average values of the corresponding clusters.

Table 4. The analysis of the deviations according to standardized indicators of economic efficiency of agricultural lands use in Lviv region

Administrative district	The analysis of the deviations		Distances
	between clusters	inside the clusters	
Brody	1.146186	0.760573	0.75350
Busk	0.561840	0.798909	0.35163
Horodok	2.478797	3.719399	0.33323
Drohobych	1.071407	0.141556	3.78440
Zhydachiv	1.385918	0.018276	37.91590
Zhovkva	1.080429	0.022210	24.32339
Zolochiv	4.557477	0.040099	56.82823
Kamianka-Buzka	2.118659	0.565037	1.87480
Mykolaiiv	1.392266	0.490127	1.42031
Mostyska	0.477710	1.111769	0.21484
Peremyshliany	0.149038	0.168737	0.44163
Pustomyty	3.940267	0.161188	12.22260
Radekhiv	4.697599	0.191292	12.27864
Sambir	5.086552	0.242913	10.46989
Skole	0.560637	1.284213	0.21828
Sokal	0.012164	0.000819	7.42302
Staryi Sambir	0.582626	0.152453	1.91084
Stryi	1.269150	0.123532	5.13694
Turka	2.003506	1.284213	0.78005
Yavoriv	0.429883	1.444085	0.14884

Source: Own calculation on the basis of data [5].

CONCLUSIONS

As a result of the conducted cluster analysis, three clusters were identified based on the economic efficiency of agricultural lands use in Lviv region:

-Skole and Turka districts, where the state of land resources is assessed as unsatisfactory;

-Sambir and Horodok districts – as areas with a satisfactory state of agricultural lands;

-Zolochiv, Kamianka-Buzka, Pustomyty, Peremyshlyansky, Mykolaiiv, Yavoriv, Staryi Sambir, Mostysks, Drohobych, Stryj, Zhydachiv, Zhovkva, Radekhiv, Busk, Sokal and Brody districts with a good state of land for the production of agricultural products.

The unsatisfactory state of use and protection of land resources in Lviv region is observed due to the extremely high economically and environmentally unjustified level of economic (primarily agricultural) development of territories; significant land-tenure of the main sectors of the economy; uneven agricultural development of territories; intensive development of degradation processes; the spontaneous formation of new types of land use in market conditions through the lease of land shares (shares) characterized by instability, fineness and through mussels; insufficiency of lands of natural reserve and other nature conservation, recreational, health and historical and cultural purposes; high level of technogenic pollution of the environment, insufficient development of ecological infrastructure; absence of programs of complex solution of issues concerning the use and protection of land; unsatisfactory state of legal and technical support that regulates the use and protection of land.

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PROSPECTS OF THE APPLICATION OF EUROPEAN PRACTICE ON EFFICIENT AGRICULTURAL LANDS USE IN UKRAINE

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Abstract

One has determined the problem of the effective use of land resources in Ukraine, which requires the application and elaboration of the provisions of methodological approaches and advanced achievements of European practice. The foreign experience of mechanisms application of land resources effective use is considered and the methods of their implementation in Ukraine are offered. One has determined that the productive production of agrarian products, taking into account the specialization of cultivating crops is the strategic vector for land management as based on the European experience. We observe that the price of grain crops compared to the EU countries is the lowest at low yield capacity, reflecting the negative state of the agrarian economy in Ukraine. One has researched the reverse dependence between the sale price and the yield of grain crops in the EU countries in 2018. One has presented a regression model that reflects the dependence between gross production and grain crops yield capacity in the EU countries for the year of 2018. It shows the close connection between them. The obtained results of grain crops analysis are recommended for predicting and planning of agricultural production, economic activity estimation, calculation of planned yield capacity, sales revenue and expenses for its cultivation on diverse lands in Ukraine and the EU countries. One has generalized the conditions for stable economic development, financial support, and coordination of actions aimed at increasing productivity of land resources due to a common agrarian policy between the EU countries and Ukraine.

Key words**:** *effective lands use, agricultural lands, yield capacity,gross production, European experience*

INTRODUCTION

To begin with, the problem of the effective use of land resources in Ukraine requires the application and elaboration of the provisions of methodological approaches and breakthrough achievements of European practice. An analysis of foreign experience will reveal the main ways of forming effective mechanisms for land resources protection. It is of vital importance to consider the experience of developed countries as to the use of economic instruments to study the mechanisms for improving land use. This experience is valuable after its testing and verification, and it gives results due to the implementation of the right to land ownership. Avramenko (2006) [1], Martyn and Kopaihora (2014) [7], Mishenin and Piznik (20120 [8], Stupen *et al*. (2018)[12], Sharyi (2013) [9], and Shvorak (2009) [10] and others studied the experience of ensuring the rational use of lands abroad. The introduction of the best practices on land resources use in the EU countries, in present-day conditions, is one of the priority tasks on improving the economic and legal model of land relations regulation in Ukraine.

MATERIALS AND METHODS

The first thing to remember is that the purpose of our research. So, we consider the foreign experience of applying the ways of land resources efficient use and propose methods for their implementation in Ukraine. Thus, in the process of the research one has used the monographic method in the study of scientific publications on land use issues in the EU countries and Ukraine; the abstract and logical method in improving the land use system; the statistical method in the study of information

on the distribution of land resources, the results of grain crops cultivation; the graphical one – for displaying statistical data; the correlation analysis – in determining the tightness of the connection between the economic indicators of growing grain crops in the EU countries.

RESULTS AND DISCUSSIONS

Ukraine predetermines its special place among other European countries due to its unique land and resource potential [11]. Ukraine occupies 5.7 % of the total land area of Europe, 60.3 % of 60.4 million hectares of land [5] is attributed to agricultural lands with high-quality composition and the level of bio-productivity (Table 1). Land use in Ukraine is less productive than in European countries and does not meet the requirements of rational nature use. The ecologically permissible ratio of arable land, natural forage lands, forest plantations, which negatively affects the stability of the agro-landscape, has been violated [1]. Excessive cultivation of the territory and the huge influence of human activity have led to a violation of the natural process of soil formation and erosion processes. Accordingly, annual environmental and economic losses from soil erosion amount to 2.9 billion Euros [8].

Table 1. The distribution of land fund in the EU countries and Ukraine in 2018, thousand hectares.

The EU countries	Agricultural lands	including			Forests
		Arable lands	Pastures	Perennial plantations	
Belgium	37,340	32,400	31.3	-	410
Bulgaria	244,860	179,650	78.2	138.3	3,870
Czech Republic	25,950	17,540	18.4	0.3	4,380
Denmark	37,380	34530	23.6	-	16,610
Germany	282,160	218,020	229.9	16.8	153,120
Estonia	18,750	10,910	16.0	7.2	13,090
Ireland	139,570	58,080	130.9	0.7	21,230
Greece	703,590	307,970	55.0	166.9	8,320
Spain	944,300	464,570	265.3	56.8	194,430
France	463,710	334,640	274.1	46.3	147,100
Croatia	157,100	125,530	70.3	115.6	60,730
Italy	1,009,440	659,210	247.3	288.5	257,160
Latvia	80,720	57,230	59.7	42.1	49,390
Lithuania	171,730	160,400	111.4	-	25,330
Luxembourg	2,060	1,510	1.7	0.2	1,030
Hungary	453,090	279,870	59.6	323.3	43,450
Netherlands	65,790	45,970	43.4	-	3,040
Austria	139,610	77,230	117.6	19.5	117,050
Poland	1,421,560	1,249,990	977.5	329.9	632,630
Portugal	263,580	179,060	77.8	170.6	134,520
Slovenia	72,280	57,290	62.3	57.9	64,540
Slovakia	22,050	17,410	10.6	7.2	490
Finland	54,230	54,100	7.3	-	49,930
Sweden	66,550	64,600	36.4	-	44,980
United Kingdom	182,180	92,530	16.8	-	57,320
Ukraine	*42,732*	*32,544*	*5,441.0*	*0.9*	*10,630*

Source: Own calculation on the basis of data [5].

Moreover, lands management systems in most European countries are more or less similar and are based on the activities of the relevant authorities. The purpose in the process of land management in the countries of the European Union can be classified into the following groups:

•conducting lands consolidation (creation of a land reserve for exchange);

•support of the land market (an increase of liquidity of land assets);

•purposeful impact on the land market (control of land prices and lease amounts; buying land to prevent speculation and its transfer to non-farmer ownership; preventing excessive concentration of agricultural lands, owned by individuals);

•providing structural reforms due to the implementation of rural development measures (facilitation of early retirement for farmers; support of young farmers in buying land; social assistance due to the purchase of lands in the elderly and the payment of their retirement pension);

•state lands management (transfer of state lands to lease, privatization and restitution (return to previous owners) of state lands);
•state support for rural areas (infrastructure support, flood control projects, water catchment protection, environmental re-naturalization, etc.) [7].

Having considered the European practice of land resources use, economic activity on agricultural production should be carried out in compliance with the ecological requirements of land use. You need to do the following:

- clear state regulation and control over the use of lands and their lease;
- to carry out the assessment of agricultural land according to the yield capacity of crops, taking into account the costs of their cultivation;
- to preserve the conservation of degraded and unproductive land for preservation and reproduction of land resources;
- to attract agricultural lands to the market turnover on condition of the ale of the right of the lease on land trades.

Considering these points, the strategic vector of land management is the effective use of land potential in the production of agrarian products. The major producers of agricultural products are farms in the EU countries. They are characterized by a high level of specialization in agricultural crops production. The possibilities of their cultivation depend on the complex approach to increasing soil fertility, reduction of anthropogenic loading, taking into account agro-biological requirements of plants under modern economic conditions of farming. According to Eurostat statistics for the year of 2017, in the EU countries [2] the largest area of arable land is occupied by grain crops – 32.3 % (57,759.97 thousand hectares), with 59.8 % (106,931.53 thousand hectares) (Fig. 1).

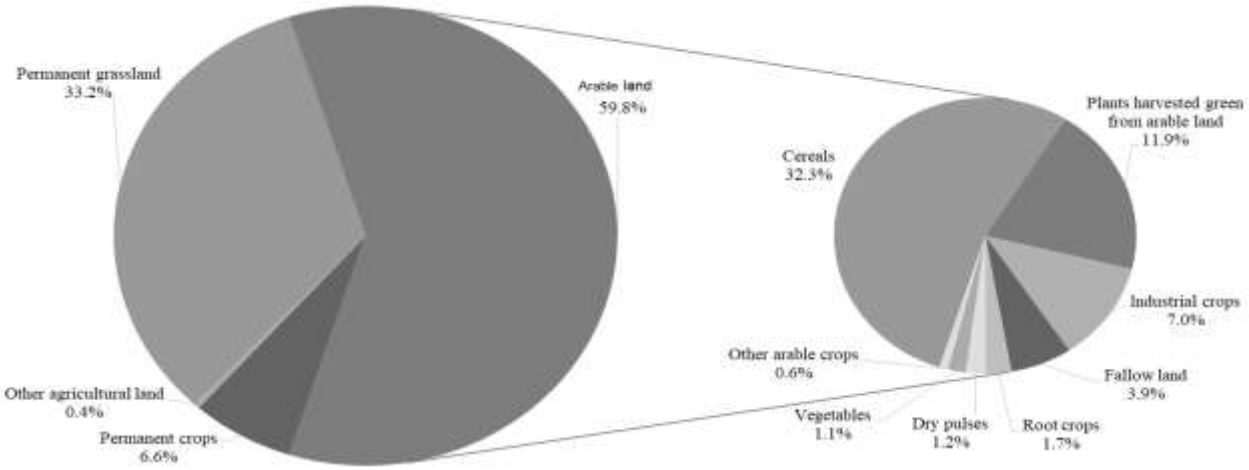

Fig. 1. An area of crops cultivation in the EU countries for the year of 2017, %.
Source: Own calculation on the basis of data [2].

The yield capacity of crops in Belgium, Ireland and the Netherlands in 2017 is quite high and is 96.08 centners/ha, 90.33 centners/ha and 87.24 centners/ha, respectively (Fig. 2). On the other hand, in Ukraine, the yield capacity of grain crops is not the smallest and equates to 33.9 centners/ha at the level with the countries of Spain – 32.51 centners/ha and Greece – 35.69 centners/ha [3], which does not have the proper natural and climatic conditions for their cultivation. The yield capacity of grain crops in Ukraine is on average twice lower than in the EU countries, due to the use of non-qualitative seed material and inefficient agrotechnology. The average sale price of grain crops for most of the EU countries in 2017 is 15.3 Eeuros/100 centners furthermore, it centners is higher in France – 20.1 Euros/100 centners and Greece – 18.8 Euros/100 centners [6] with yield capacity of grain crops of 75.85 centners per hectare and 35.69 centners per hectare respectively (Fig. 2). In Ukraine, the price of grain crops compared to the EU countries is the lowest and stands at 12.36 Euros/100

centners, which negatively affects the state of the agrarian economy in the country at a low yield of 33.9 centners/ha of grain crops if there are fertile soils. However, price growth is possible provided that the quality of grain crops is improved and the costs of their growing increase when they are sold on favorable terms of sales.

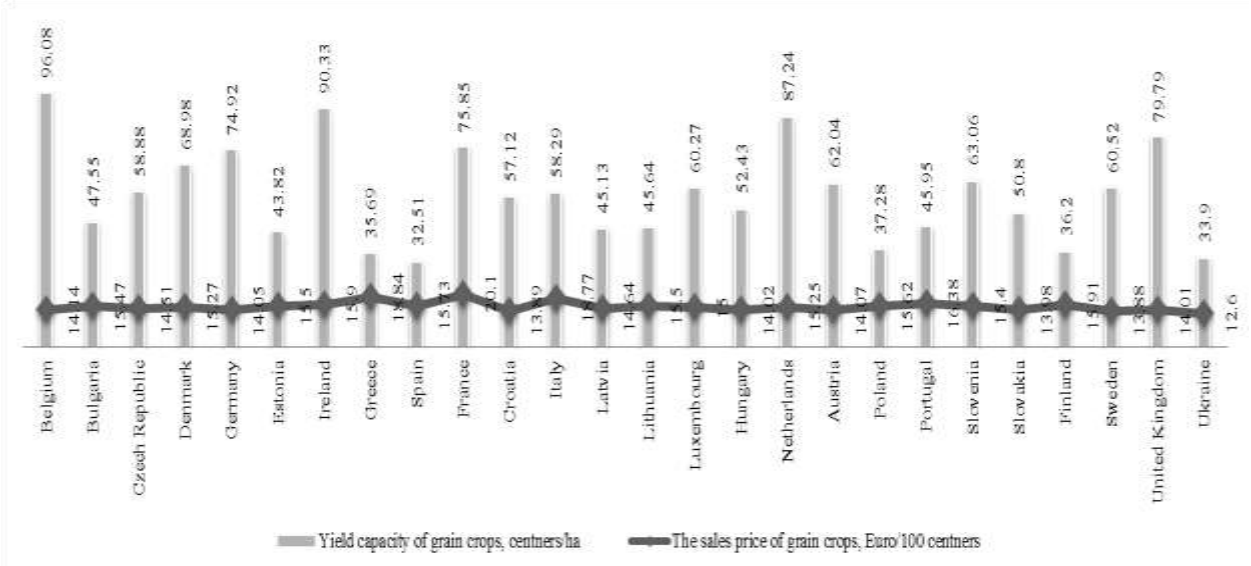

Fig. 2. Results of growing crops in the EU countries, 2018.
Source: Own calculation on the basis of data [3, 6].

We make the conclusion on the reverse dependence between the sale price and the yield capacity of grain crops by agricultural enterprises in the EU countries in 2018, using information from Fig. 3. The value of the correlation coefficient for these factors is – 0.48. The reverse relationship indicates that the decrease in the yield capacity of grain crop will result in an increase in their sale price by 0.2425 per centner, in line with the trend line regression equation, y = 0.2425x.

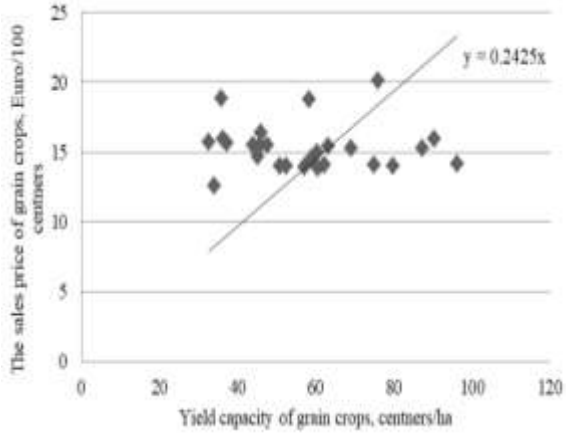

Fig. 3. Dependence between the selling price and yield capacity of grain crops in the EU countries, 2018
Source: Own calculation on the basis of data [3, 6].

In accordance with Eurostat [4], we will present the regression model y = 339.84x, which reflects the relationship between gross production and yield capacity of grain crops by agricultural enterprises in the EU countries in 2018 (Fig. 4). The results of the equation show that gross production will grow by 339.84 thousand Eeuros while increasing the yield of grain crops per centner.The value of the correlation coefficient between the productive and the factor is 0.90, which indicates a close connection between them.

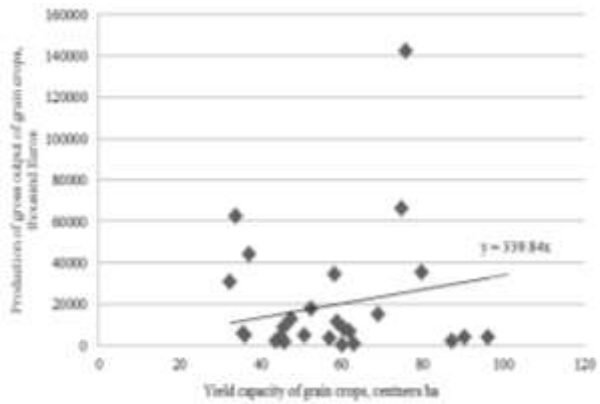

Fig. 4. Dependence between production of gross production and yield capacity of grain crop in the EU countries, 2018
Source: Own calculation on the basis of data [3, 4].

Production of gross output depends on economic factors of agricultural production, which reflects the level of profitability and is extremely low in Ukraine. It is expedient to reduce the cost of production and increase its sales prices in order to increase income. However, price growth is possible provided that the quality of grain crops is improved and the costs of their growing decrease when they are sold on favorable terms of sales. The obtained results of grain crop analysis should be used for prediction and planning of agricultural production, estimation of economic activity, calculation of planned yield, sales volume and costs for its cultivation on different quality lands in the EU countries.

CONCLUSIONS

Taking into consideration approaching the use of land resources to the level of the EU requirements, one can expect an increase in investment flows into Ukrainian agriculture and the development of cooperation in a market economy. Integration of Ukraine into the EU in the field of rational natural resources use should be carried out by creating a normative, methodological and organizational framework that should fulfill the requirements of national and European environmental safety. However, the mechanisms for implementing measures to integrate Ukraine into the EU, in particular, the adaptation of national legislation in the field of creating a rational production system in the agricultural sector to the requirements of international legislation require improvement and significant financing. Obviously, an increase in the productivity of land resources use in agriculture depends on internal transformations in Ukraine, the creation of conditions for stable economic development, financial support and coordination of actions of, in particular, executive bodies in order to ensure the sustainable production of agricultural products.

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PHYSICOCHEMICAL CHARACTERISTICS OF CROSS-LINK MODIFIED SORGHUM FLOUR IN BANDUNG LOCAL CULTIVARS

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Abstract

Cross-link flour modification accomplished by using a phosphor which is consisted in a phosphate salt, that will form a cross-linking bridges in a granule starch structure. The used of a STPP (Sodium Trypolyphosphate) as a cross-linking reagent is a solution to resolve the issue of a native sorghum starch. The goal of the research is to determine the concentration of STPP which produces the sorghum flour with a proper physicochemical properties. The method that used in this research is an experimental method which is continued by descriptive analysis with five treatments and two replications. Research was accomplished by creating a native sorghum flour and modified sorghum starch (cross-link) with four concentrations of STPP, which are: 0.05%, 0.10%,0.15%, and 0.20%. The result of the research showed the following physicochemical characteristics: whiteness 53.95%, water content 9.62%, water absorption capacity 21.61%, water absorption capacity 21.61%, swelling power 6.53%, solubility 4.67%, oil absorption capacity 11.94%, protein content 6.26%, fat content 1.69%, ash content 1.14%, 81.30% carbohydrate; the starch content 53.16%, amylose content 13.23%, and amylopectin content of 39.94%.

Key words**:** *cross link, flour modification, sorghum*

INTRODUCTION

Sorghum flour could be used as an alternative food to substitute the needs of flour. In producing sorghum flour with good characteristics, modifications on its starch content should be made, therefore the natural weakness on both physical and chemical characteristics on the starch could be improved. In food industry, the use of cross-link modified starch is widely used to provide stability on starch granule structure and to prevent swelling [5]. Cross-link reaction is a chemical modification by strengthening the hydrogen bond within starch granule using chemical compound acting as a bridge or new bond between the starch molecules, done to thickening, stabilizing, and texturizing the starch [4].

The compound often used in food industry is POCI3, sodium trymetaphosphate (STMP), and sodium trypolyphosphate (STPP) [1]. This research is using STPP reagent which could improve paste clarity, viscosity, and water binding capability. STPP compound could form intermolecular eter or ester by forming cross bond bridges between hydroxyl groups within starch compound [3] will result in biomolecular reaction between phosphate groups and starch, causing starch diester. Stated that the use of STPP reagent with pH balance bigger than 10 could produce diphosphate starch which is able to improve retrogradation endurance, high temperature, and low pH compared to native starch, through cross-linking reactions. World Health Organization (WHO) conducted a review of several countries and the results of the percentage of occurrence gastritis in England 22%, China 31%, Japan 14.5%, Canada 35% and French 29.5%. In the world, gastritis affects 1.8–2.1 million of the population each year. The occurrences of gastritis in Southeast Asia is approximately 583,635 of the population each year. The prevalence of endoscopic confirmed gastritis in population at Shanghai is approximately 17.2% which is substantially higher than the population in the west which approximately 4.1% and is asymptomatic. Gastritis is usually considered as a little thing, but gastritis is the beginning of a disease that could cause a trouble.

MATERIALS AND METHODS

The main materials used in this research are white local Bandung cultivar sorghum flour and STPP. Research method used in this research is experimental method followed by descriptive analysis with 2 repetitions.
Treatments are:
A = native sorghum flour (control)
B = cross-link modified sorghum flour with 0.05% STPP concentrate
C = cross-link modified sorghum flour with 0.1% STPP concentrate
D = cross-link modified sorghum flour with 0.15% STPP concentrate
E = cross-link modified sorghum flour with 0.2% STPP concentrate
A data matriculation table is made to show the difference between modified sorghum flour and native sorghum flour.

Research Implementation:
(i)Production on flour suspension. Flour is dissolved with water with water and starch ratio of 2 : 3 and then added with 10% NA_2SO_4 from flour amount to prevent granule swelling.
(ii)Flour suspension pH conditioning. Flour suspension is conditioned in pH 11 using NaOH 1N which is given drops by drops until the desired pH is achieved.
(iii)Addition of STPP reagent according to treatments
(iv)Heating and stirring for 60 minutes with a temperature of 40^0 C.
(v)Neutralizing flour suspension pH (pH 11) by giving drops of HCl 1 N until the pH reaches 6.5.
(vi)Flour washing, done to remove side substances from cross-link reactions.
(vii)Centrifugations, with speed of 3,000 rpm for 10 minutes, to separate flour and liquid.
(viii)Flour drying using cabinet dryer oven with a temperature of 40^0C for 16 hours.
(ix)Flour drilling using grinder and flour sieving using 80 meshtyler sieve.

RESULTS AND DISCUSSIONS

Whiteness Degree

Whiteness degree is an important parameter in determining quality of a flour product. Research result on whiteness degree of native sorghum flour and cross-link modified sorghum flour is shown on Table 1.

Table 1. Whiteness Degree of Native and Cross-link Modified Sorghum Flour

STPP Concentration	Whiteness Degree (%)
A Native	60.93
B STPP 0.05%	54.18
C STPP 0.10%	50.88
D STPP 0.15%	55.55
E STPP 0.20%	53.95

Source: Processed Data.

According to Table 1, the value of the degree of white sorghum flour modified cross-linked ranged from 50.88 to 55.55% and for sorghum flour whiteness naturally has a value of 60.93%. Whiteness degree of sorghum flour modified cross-links have a lower value than natural sorghum flour, whereas through visual observation of the colour of white flour is dull. Whiteness degree is measured using whiteness meter method compared to standard whiteness value of 87.5% $BaSO_4$. Change the colour becomes brown after a process of modification resulting from the use of NaOH which causes alkaline conditions at the time of the modification.

Water Content

Table 2. Water Content of Native and Cross-link Modified SorghumFlour

STPP Concentration	Water Content (%)
A Native	7.67
B STPP 0.05%	8.64
C STPP 0.10%	9.03
D STPP 0.15%	9.37
E STPP 0.20%	9.62

Source: Processed Data.

Based on Table 2, cross-link modification on sorghum flour showed an increasing trend towards water content along with the increasing concentration of STPP. The water content of modified flour ranges from 8.64 to 9.62% while the water content of native sorghum flour is 7.67%. Increased water levels are in line with the increased concentration of STPP, caused by the growing substitution of phosphate groups in substituting the –OH group. OH molecules apart would bind and form water, so the water content in sorghum modification increased

[6]. The water content on cross-link modified sorghum flour with 0.05% and 0.20% STPP concentrate is appropriate according to Codex Standard 173-1989 Rev. I-1995, where maximum water content on sorghum is 15%, therefore it is qualify to be stored at room temperature.

Water Absorption Capacity

Table 3. Water Absorption Capacity of Native and Cross-link Modified Sorghum Flour

STPP Concentration	Water Absorption Capacity (%)
A Native	14.31
B STPP 0.05%	17.43
C STPP 0.10%	18.69
D STPP 0.15%	19.56
E STPP 0.20%	21.61

Source: Processed Data.

Based on Table 3, cross-link modification shows an increase in the water absorption capacity along with the increasing concentration of STPP. Values of water absorption capacity of modified sorghum flour ranged between 17.43 to 21.61%, while the value of water absorption capacity of native sorghum flour is 14.31%. Increasing concentrations of STPP is added to the modification of cross-link could be expected as the increasing value of water absorption capacity. Crosslink modification with increased crosslink reagent concentration, increasing the water absorption capacity. The addition of reagents containing phosphorus which acts as a bridge crosslink may affect the ability of water absorption. Cluster phosphorus is a hydrophilic group that is able to bind water. The higher the concentration of STPP, the phosphorus content in the flour will be increased so that the amount of hydrophilic group will increase as well. This greatly affects the increase in water absorption capacity.

The modification process by cross-linking is done in an alkaline pH, also influence the water absorption capacity of flour. This is due, alkaline pH can cause structural modifications granules which can increase the capacity of hydration. Conditioning of pH in alkaline state, causing the phosphorylation process that occurs in the modification of cross-link becomes stronger so as to produce more stable starch granules.

Swelling Power

Table 4. Swelling Power of Native and Cross-link Modified Sorghum Flour

STPP Concentration	Swelling Power (%)
A Native	5.66
B STPP 0.05%	5.78
C STPP 0.10%	6.49
D STPP 0.15%	6.09
E STPP 0.20%	6.53

Source: Processed Data.

Cross-link modification shows an increase in the value of swelling power along with the increasing concentration of STPP than native sorghum flour. Based on the results, the value of a modification sorghum flour swelling power are ranging from 5.78 to 6.53%.

The high value of sorghum flour swelling power on modifications to cross-link due to the presence of a compound suspected to crosslink the starch granules. Negatively charged phosphate groups will give the repulsive force between starch molecules, so is thought to decrease the relationship between the molecular chains of starch and provide hydration levels are higher in starch molecule that causes increased swelling power [2].

Swelling power level of cross-link modified sorghum flour is increased compared to native sorghum flour, but swelling power of native sorghum flour and cross-link modified sorghum flour are lower compared to wheat flour, which is 10.17 g gel/g. The results show that cross-link modified sorghum flour could improve dough expandability, however it is not as good as wheat flour.

Solubility

The results of the analysis of the solubility of cross-link modification sorghum flour showed a decline in the value of solubility along with the increasing concentration of STPP. Native sorghum flour have a higher value than its solubility in sorghum modification crosslink, which amounted to 18.36%.

This is caused due to an increase in cross-link density compounds in the structure of starch that can reduce the level of damage to the starch granules during gelatinization. While

the value of solubility of modification sorghum flour ranged between 4.67 to 5.73%. Value indicates a low solubility in sorghum increasingly difficult to dissolve in water. Crosslinking bonds can increase the strength of the starch granules that can reduce damage granules during gelatinization which causes a decrease in solubility.

Table 5. Solubility of Native and Cross-link Modified Sorghum Flour

STPP Cncentration	Solubility (%)
A Native	18.36
B STPP 0.05%	5.73
C STPP 0.10%	5.50
D STPP 0.15%	4.91
E STPP 0.20%	4.67

Source: Processed Data.

Oil Absorption Capacity

Table 6. Oil Absorption Capacity of Native and Cross-link Modified Sorghum Flour

STPP Concentration	Oil Absorption Capacity (%)
A Native	8.30
B STPP 0.05%	9.56
C STPP 0.10%	10.70
D STPP 0.15%	11.20
E STPP 0.20%	11.94

Source: Processed Data.

Cross-link modification shows an increase in the oil absorption capacity along with the increasing concentration of STPP. Sorghum flour naturally has a lower value than the oil capacity of the modified sorghum flour. Based on the results, the value of a modification of the sorghum flour ranged from 9.56 to 11.94%, while the value of natural sorghum flour was 8.30%.

Oil absorption capacity increased in the sorghum flour modification, suspected due to an increase in fat content occurs. Oil absorption capacity is related to levels of fat contained in flour. The greater the fat content of the flour, the greater the oil absorption capacity. It is associated with the presence of amylose-lipid complexes formed during the modification process. Increased levels of amylose and fat levels in the sorghum flour modification cause more amylose-lipid complexes are formed, which result in increased oil absorption capacity.

Protein Content

Based on Table 7, it can be seen that the protein content of sorghum flour modified by cross-link using STPP ranges from 6.26 to 6.67% while the protein content of native sorghum flour has a value of 8.39%. The modification process cross-link on sorghum showed a decrease in the protein content with increasing concentrations of STPP used.

Table 7. Protein Content of Native and Cross-link Modified Sorghum Flour

STPP Concentration	Protein Content (%)
A Native	8.39
B STPP 0.05%	6.67
C STPP 0.10%	6.57
D STPP 0.15%	6.46
E STPP 0.20%	6.26

Source: Processed Data.

Decreased levels of a protein thought to be caused by the process of dissolving the protein in a saline solution. The presence of salt can cause increased protein solubility. This is because the inorganic ions contained in salt compounds will bind to the surface of the protein and prevent the incorporation of protein molecules. Increasing concentrations of STPP made in the modification process causes the solubility of proteins to salt increased. This causes the protein contained in the modification of the sorghum flour decreased.

Protein content of native sorghum flour and cross-link modified sorghum flour with 0.05%, 0.10%, 0.15%, and 0.20% STPP concentrate is not appropriate according to sorghum flour on Codex Standard 173-1989 Rev. I-1995, where the minimum protein content of sorghum is 8.5%.

Fat Content

Table 8. Fat Content of Native and Cross-link Modified Sorghum Flour

STPP Concentration	Fat Content (%)
A Native	1.20
B STPP 0.05%	1.93
C STPP 0.10%	1.75
D STPP 0.15%	1.81
E STPP 0.20%	1.69

Source: Processed Data.

According to Table 8, the fat content of sorghum flour crosslink modification has a

higher value than native sorghum flour, which ranged from 1.69 to 1.93%, where the value of the fat content of native sorghum flour is 1.20%.Increasing concentrations of STPP could be expected to cause more ionic bonds contained in starch.

Ionic bonds have a strong electron potential, the higher the electronegativity of an atom, then the ability of an atom to attract bonding electrons when the atom is present as a molecule becomes stronger. The addition of STPP made on the basis crosslink modification causes some proteins that are in the globulin fraction undergo dissolution. Potential electrons more strongly held STPP lead compounds bind to the protein easier phosphate salt compounds that cause covalent protein and fat is dismissed. The more the concentration of salt STPP is added, the more proteins are dissolved, resulting in the termination of covalent bonds so that the fat count as fat content increased.

Fat content of native sorghum flour and cross-link modified sorghum flour with 0.05%, 0.10%, 0.15%, and 0.20% STPP concentrate is not appropriate according to sorghum flour in Codex Standard 173-1989 Rev. I-1995, where the minimum fat content of sorghum flour is 2.2%.

Ash Content

Table 9. Ash Content of Native and Cross-link Modified Sorghum Flour

STPP Concentration	Ash Content (%)
A Native	0.81
B STPP 0.05%	1.52
C STPP 0.10%	1.28
D STPP 0.15%	1.14
E STPP 0.20%	1.14

Source: Processed Data.

According to Table 9, it is known that the ash content of sorghum flour modified by cross-link using STPP has a higher value than native sorghum flour. The ash content in sorghum modifications ranging from 1.14% - 1.52% while the ash content of native sorghum flour is 0.81%.Increased levels of ash caused by the use of reagents STPP during the modification process. The more phosphate groups attached, hence increasing ash content because phosphate is a constituent component of ash [7].

Ash content on native sorghum flour and cross-link modified sorghum flour with 0.10%, 0.15%, and 0.20% STPP concentrate is appropriate according to sorghum flour on Codex Standard 173-1989 Rev. I-1995, where the maximum ash content is 1.5%, but ash content of cross-link modified sorghum flour with 0.05% STPP concentrate has not yet appropriate according to Codex Standard 172-1989 Rev. I-1995.

Carbohydrate Content

Table 10. Carbohydrate Content of Native and Cross-link Modified SorghumFlour

STPP Concentration	Carbohydrate Content (%)
A Native	81.94
B STPP 0.05%	81.23
C STPP 0.10%	81.18
D STPP 0.15%	81.24
E STPP 0.20%	81.30

Source: Processed Data.

Carbohydrate levels are calculated by difference, it means that the content is obtained from the reduction of the number 100 as a percentage of other components, such as moisture content, ash content, fat content and protein content. The downward trend of carbohydrate levels occurred along with an increase in the concentration of STPP. Decreased levels of carbohydrates suspected due to leaching processes during the process of cross-link modification. The use of HCl during the modification process can lead to the dissolution of sugar and carbohydrate components contained in the sorghum flour.

Carbohydrate level on native sorghum flour and cross-link modified sorghum flour are higher compared to wheat flour, which has carbohydrate level of 77.30%. Starch level of native sorghum flour and modified sorghum flour are lower compared to starch level of corn flour, which is 60.07%.

Starch, Amylose, and Amylopectin Content

Sorghum starch modification has a lower value than natural sorghum starch content, which ranged from 53.16 to 57.90%, while the starch content of native sorghum flour's value is 59.78%.The hydrogen bridges in the starch molecule is substituted by a phosphate compound that forms the phosphate bridge.

Bound starch phosphate bridges are not counted as starch compounds, so more bridges phosphate is formed, the decreased levels of starch is detected.

Table 11. Starch, Amylose, Amylopectin Content of Native and Cross-link Modified Sorghum Flour

STPP Concentration	Starch Content (%)	Amylose Content (%)	Amylopectin Content (%)
A Native	59.78	11.64	48.14
B STPP 0.05%	57.90	12.24	45.67
C STPP 0.10%	55.55	13.10	42,45
D STPP 0.15%	54.36	13.35	41.01
E STPP 0.20%	53.16	1.23	39.94

Source: Processed Data.

According to Table 11, amylose content of modified sorghum flour has a higher value than native sorghum flour. Amylose content of modification cross-linked sorghum flour ranged from 12.24 to 13.35%, while amylose content of native sorghum flour is 11.64%, while the amylopectin content is decreased when the sorghum flour is modified. The amylopectin content ranged from 39.94-45.67%, while the amylopectin content of native sorghum flour is 48.14%.

Increased level of amylose is in line with the increased concentration of STPP added. This is due to the higher concentration of STPP is used, the more the phosphate groups which replaces the hydroxyl group binds to amylose in higher numbers, which causes the proportion of amylose changes. The amylopectin molecules are more prone to crosslinking than amylose molecules, so that the amylopectin molecules join together to produce a few molecules in size large. This causes the proportion of amylopectin to amylose increased. The increasing levels of amylose in the starch structure, will cause a lower levels of amylopectin in starch content.

Based on Table 11, starch and amylopectin level on modified sorghum flour has a lower value compared to native sorghum flour, but higher amylose level compared to native sorghum flour. Based on the classification from IRRI (International Rice Research Institute), amylose level of starch food is classified into three, which are low amylose (<20%), medium amylose (20-25%), and high amylose (>25%). Therefore based on amylose level test, cross-link modified sorghum flour using STPP with 0.05-0.20% concentrate is classified as starch food with low amylose level.

CONCLUSIONS

The modification of the sorghum flour using a modified cross-link concentrations of 0.20% STPP produced a sorghum flour with physicochemical characteristics better than natural sorghum flour as follows: whiteness 53.95%, water content of 9.62%, water absorption capacity of 21.61%, swelling power of 6.53%, solubility of 4.67%, oil absorption capacity of 11.94%, protein content of 6.26%, fat content 1.69%, ash content of 1.14%, 81.30% carbohydrate, the starch content of 53.16%, amylose content of 13.23%, and amylopectin content of 39.94%.

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AGRICULTURE AND CLIMATE CHANGE

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Abstract

Agriculture plays a rather important role in the Romanian economy, with the agricultural sector accounting for 4.3% of GDP at the end of 2017. The agricultural sector is represented by different branches and production systems that have an essential and strategic role in improving the quality of life and quality by supplying various Romanian and / or organic products on the market. The agricultural sector is non-indispensable and indispensable to man. But, what is the link between climate change and agriculture, what does this relationship define? Agriculture is the victim of climate change or is agriculture responsible for climate change? This paper seeks to analyze climatic factors with a major influence on agriculture characterized by: temperature and precipitation, but also the role played by agriculture in climate change through greenhouse gas emissions. The paper deals with a topic of national, European and global interest, because these climate changes are reflected in food production, land and marine ecosystems, affecting the economy and the main culprit, the man.

Key words: *adaptability, agro-environment, climate, pollution*

INTRODUCTION

Climate change is increasing more and more from time to time, and it can be seen from the high-temperature differences that are unusual at certain times of the year. Climate gaining extreme features in the winter, with higher temperatures and lower snowfall, while the spring arrives earlier, recording temperatures above normal. All these changes affect man, as well the activities undertaken by him, such as agriculture. The factors that contributing to these climate change are numerous, and these are the result of how people carry out their activities in everyday life.

Whether we are talking about greenhouse gas emissions, non-biodegradable waste, non-environmentally friendly substances discharged into unsuitable places or others, it is certain that those that most influence climate change are greenhouse gases, the other affecting structures of different ecosystems. Greenhouse gases are a result of energy production centres, factories producing different goods, means of transport used in our travels (cars, planes, etc.) or differed farms producing and processing human daily food.

In order to focus our attention on the topic of this theme, it will highlight the factors that influencing climate change, as well as its effect on agriculture. Also, data on how agriculture is practiced at the national level and factors influencing the climate will be presented, on the basis of these aspects will be set the relationship between agriculture and climate change. The issue of agriculture and climate change has grown since 1970 [13], when it began to talk more and more often about the changes that man causes in the environment, so this topic has been brought to the attention of the institutions and the public through the environmental protection movements, also through alarm signals that are drawn by scientists around the world. The "Man-Made Climatic Changes," published by Helmut E. Landsberg (1970) [13], talks about how human activities have changed the climate in rural and urban areas and can affect the global climate in the future. Since then, greenhouse gases have been discussed and, through the work mentioned above, the author proposes to eliminate or reduce these gases directly from the source.

At a 43-year difference, more precisely in 2013, Hoffmann U. talks about the same

issues that man creates in the environment through his various activities. Through the paper "Agriculture - a key driver and a major victim of global warming," [11] the author talks about the relationship between agriculture and climate change, underlining the fact that they are in a process of interdependence.

This issue of climate change has grown from one year to the next, being widely debated (European and world level) trying to find the causes and solutions that support the environment and humanity.[6]

Thus, in 2018, a series of studies and reports on the impact of CO2 emissions on human nutrition at the global level were launched, and through the work "Impact of anthropogenic CO2 emissions on global human nutrition" Smith, Matthew R. and Myers, Samuel S. mentions that in common food crops a reduction of 3 to 17% in zinc, protein and iron [15] content would be noted. While, Hille Karl mentions through the paper "Rising carbon dioxide levels will help and hurt crops", the impact of this gas on crops is noticeable by increasing the rate of photosynthesis, favouring faster water loss as a result of stomata closure. [10]

Climate change such as global warming is also felt on precipitation, and this is due to the evaporation increases that lead to storms in some areas, but also to the emergence of arid areas creating an imbalanced climate through: floods and droughts. [12]

Porter, JR and al, said in "Food Safety and Food Production Systems" chapter 7 in the report "Climate Change 2014: Impact, Adaptation and Vulnerability" that climate change is already affecting agriculture, with unequal effects distributed around the globe. These changes will increase the risk of food insecurity for vulnerable groups (those with a difficult financial situation). [2]

As mentioned in the summary of this paper, the subject is of interest and requires highlighting and defining the relationship between agriculture and climate change.

MATERIALS AND METHODS

The processed information is statistically provided by the competent institutions (National Institute of Statistics, Eurostat, Faostat) regarding the average outputs for the culture under analysis, as well as data on meteorological factors (temperatures, precipitations) provided by the National Meteorological Administration.

The statistical data will show the influence of climatic factors on crop yield.

Also, to determine the influence that agriculture has on climate change, data on gas emissions will be analysed, data provided by the European Environment Agency.

Thus, by analysing the meteorological and agricultural factors, the aim was to achieve the proposed objective by studying and modelling the selected data, making a correlation between agriculture and climate change, establishing the relationship between them, using the simple linear regression statistic-econometric model, using SPSS program.

The literature as well as the legislation in the field of environmental pollution and greenhouse gas emissions were also analysed.

RESULTS AND DISCUSSIONS

In the last 20 years at national level, average yields for rapeseed crops showed fluctuations from one year to the next, thus the largest decrease in average production was recorded in 1998 as compared to the previous year when it decreased by 35.2% (520 kg / ha). At the opposite end, the highest increase in average production is the year 2004 compared to 2003, when it grows approximately 3 times, meaning an abundance of 1,511 kg / ha. [16]

According to figure 1, the highest average yield of rapeseed at national level is registered in 2016, which is 2,835 kg / ha, 13.4% higher than the previous year and 75% higher than in 1997 The average production at region level also shows oscillations from one year to the next, the highest being registered in 2014 by 2,631 kg / ha. The most significant decrease of the average production in the region is registered in 2000 compared to the previous year when it decreases by 43.8%, while at the

opposite pole, the largest increase is registered in 2001 compared to the year 2000, when the average production equals and grows approximately twice.

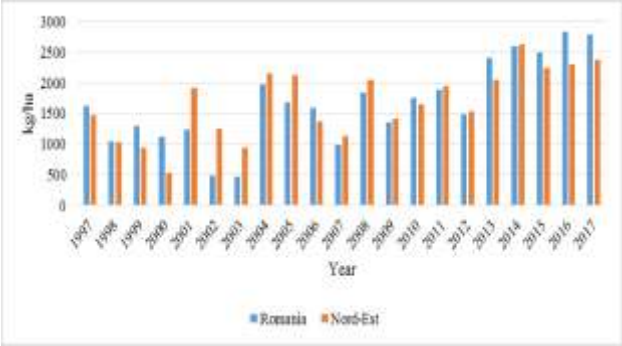

Fig. 1. Mean rapeseed production at national and Northeast level
Source: own design based on statistical data provided by INS, 2019.

The factors that contributed to these yield oscillations for rape crops are varied, but to get closer to the subject of this paper, it is necessary to highlight and analyze climatic factors to determine how they affect the yield of the present crop.

The plant's requirements for climate and soil are the same, but climatic factors (temperature, precipitation) differ from one county to another, so we don't have to generalize, as the results will not be conclusive. Thus, as the average production of the rapeseed in a single region has been analyzed, it is necessary to analyze the climatic factors on the same region (North-East) comprising the counties: Iasi, Suceava, Bacau, Neamt, Botosani, Vaslui.

Using the data provided by the National Meteorological Institute [14] as well as the archives provided by the wunderground.com site [4], the average temperature measured in Celsius degrees and the precipitations measured in millimeters during each calendar month for the entire analyzed period, respectively 1997-2017, we can observe the temperature and precipitation differences for the region studied. These will be correlated with average yields for rapeseed, but in order to be correlated, it will be necessary, to sum up the grades and precipitations for each year, since the number of variables analyzed is not equal, thus to create the simple linear regression model the number of variables must be equal.

For the North East region, the sum of median monthly grades showed an upward trend for the analyzed period (according to the trend line, figure 2), so that the sum of the grades is 7.84% higher in 2007 compared to the sum of the grades registered in 1997, while the sum of grades in 2017 is 36.94% higher than in 2007 and by 47.68% higher than those registered in 1997 (Fig. 2). This can also be seen in Fig. 3 when the average monthly temperature values are taken into account. In the figure above, it can be noticed that the temperatures for the year 2017 have increased considerably compared to those of the years 2007 and 1997.

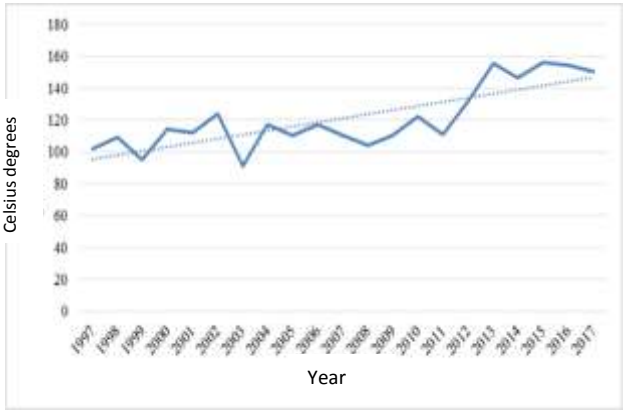

Fig. 2. Sum of monthly average grades in a calendar year-North East Region
Source: own processing of statistical data provided by INMH;(https://www.wunderground.com/history/monthly/en/LRBS/ date / 1997-17).

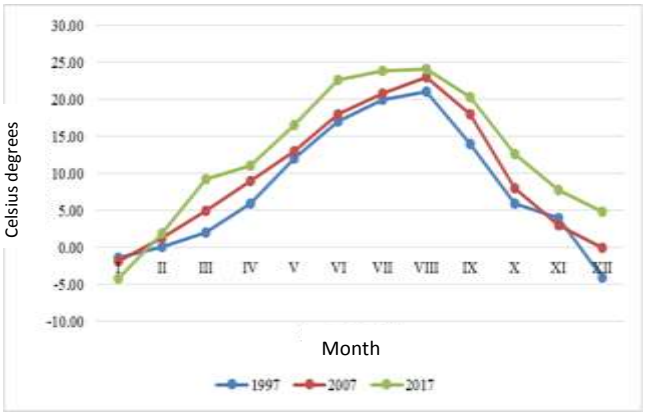

Fig.3. Average temperature per month North East Region
Source: own processing of statistical data provided by INMH;(https://www.wunderground.com/history/monthly/en/LRBS/ date / 1997-17).

The sum of the average monthly rainfall in the North-East region kept a balanced trend, but they did not record significant changes, but according to figure no. 4 the trend is decreasing (according to the trend line). Analyzing the precipitations from 2007 as compared to 1997, it is noted that they decreased by 7.063%, while the rainfall recorded in 2017 decreased by 3.17% compared to 2007 and by 10.01% as compared to 1997. This can also be seen in Figure 5 when average precipitation values are taken according to the month, with year 2017 coming out of normal parameters.

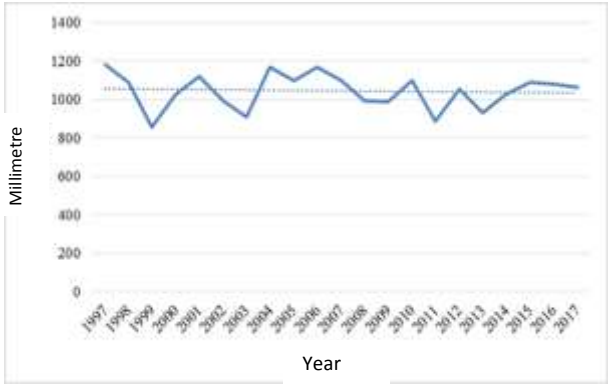

Fig. 4. Sum of monthly average rainfall in a calendar year North East Region
Source: own processing of statistical data provided by INMH.

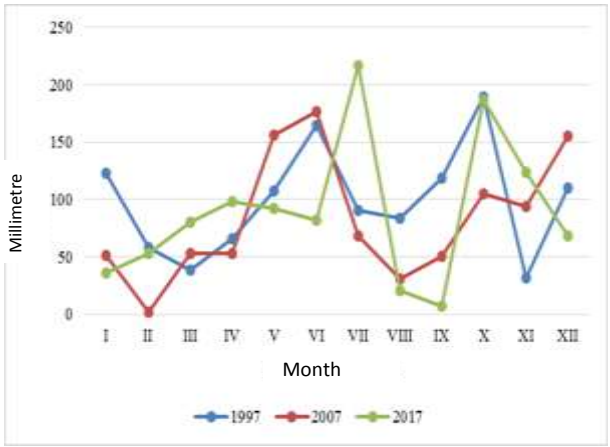

Fig. 5. Monthly average precipitation North East Region
Source: own processing of statistical data provided by INMH.

The lowest amount of precipitations in 2017 was recorded in August and September, excess moisture in July of the same year had negative influences on crops leading to calamity in important areas sown with grain and autumn rape.

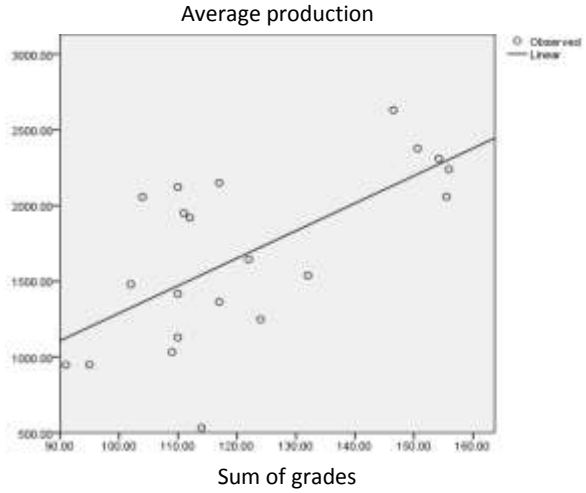

Fig. 6. Evolution of average rapeseed production according to year-to-year variation in the North East region
Source: processing of statistical data in SPSS.

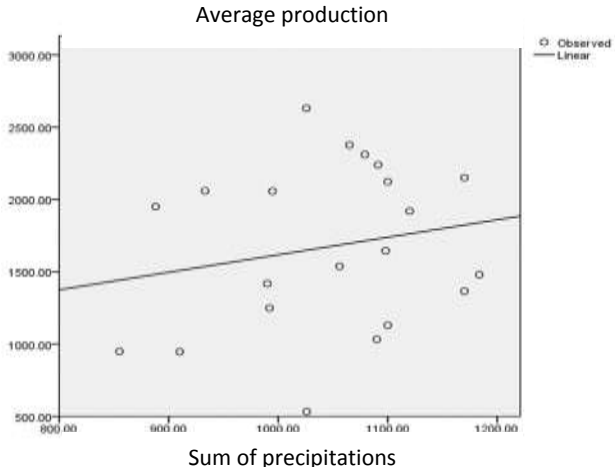

Fig.7. Evolution of average rapeseed production depending on annual rainfall variation in the North East region
Source: processing of statistical data in SPSS.

From the two graphs above, respectively Figures 6-7, we can see two independent variables represented by the sum of the degrees and the sum of the precipitations and a dependent variable represented by the average production for both graphs.
The function is a linear one and is guided by the following equation: $y = ax + b + \varepsilon$, where y represents the dependent variable, and x represents the independent variable. Thus, according to the simple linear regression analysis model, using the SPSS calculation program results a close relationship between the two variables analysed in the first graph

(Figure 6), which shows that the average yield of rape is influenced by the average annual temperatures, the correlation being 0.6459. Regarding the influence of rainfall on the average yield of rapeseed, a correlation of 0.1970 results, which shows that the average production is not closely related to the annual rainfall, so production is not influenced by precipitation.

Of course, this does not apply to all crops, as climate and soil requirements are particular to each plant. For example, according to the paper "Influence of meteorological factors on production per hectare of maize crop in the South-Muntenia region" [5], the production obtained in maize culture is influenced by the annual rainfall, the correlation being of 0.845.

Thus, after determining the degree of correlation between the variables presented, it can be stated that the average yield of rapeseed was lower in the years when the temperatures were higher, taking as an example years 2015-2017 we can see that the average yield of rapeseed has decreased compared to the previous years (Fig. 1) and this because of the constantly growing temptations (Fig. 2).

Climate changes that are observed by temperatures above or below normal, or through rich or poor quantitative rainfall, have a direct impact on agriculture, influencing both the quantity and quality of the resulting plant products. [3]

The underlying causes of these climate change are mainly caused by greenhouse gases that have increased due to the activities that people undertake. These gases capture the heat and radiate it back to the terrestrial surface, this phenomenon being known as the "greenhouse effect". [9]

These greenhouse gases come from most economic sectors, but according to statistics in 2016 at European level, agriculture was 9.58%, broken down as follows: 4.32% represents enteric fermentation (CH4-methane), 1.48 % manure management, 0.06% rice cultivation; 3.67% nitrification and denitrification of agricultural soils; 0.06% on-farm burning of agricultural residues and others.[8]

According to Eurostat statistics, the evolution of greenhouse gas emissions in Romanian agriculture for the period 1990-2016 registered a significant decrease with a reduction of 18.5 million tons of CO2 equivalent. [7]

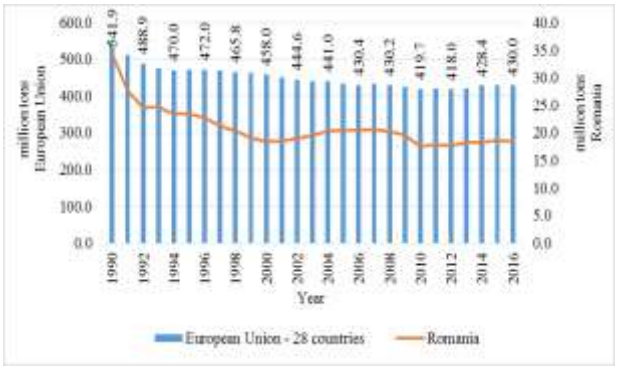

Fig. 8. Agricultural greenhouse gases in agriculture at European and national level (CO2, N2O, CH4, HFC, PFC, SF6, NF3).
Source: own design based on statistical data provided by Eurostat; European Environment Agency (EEA).

According to Figure 8, the greenhouse gas emissions from agriculture have gradually decreased at the European level, so that in 2016 compared to 1990 they decreased by 20.65%, while compared to 2006 they declined by only 0.1 %. The share of Romania in total greenhouse gas emissions at European level is on average for the analysed period of 4.609% and the most significant weight being in the year 1990 of 6.32%. [8] As with European gas emissions, greenhouse gas emissions at national level have declined gradually, so in 2016 they decreased by 46.49% compared to 1990 and by 10.73% compared to 1990 of the year 2006.

To create a correlation between the two variables, namely agricultural gas emissions and climate effects, it is necessary to approximate how much greenhouse gas emissions is attributed to the analysed region, namely North East.

As greenhouse gas emissions from agriculture are presented in European statistics across the country, it has been broken down by region according to the share of each region in the formation of agriculture at national level. Thus, the North-East region has a share of the value of production in agriculture in 2016 of 16.06%, so for 2016 the greenhouse gas

emissions were determined for the region concerned according to the percentage that this region has in the weight agriculture.

Fig. 9. Agricultural greenhouse gases in agriculture at national and regional level (CO2, N2O, CH4, HFC, PFC, SF6, NF3)
Source: own design based on statistical data provided by Eurostat; European Environment Agency (EEA).

In order to determine the influence that greenhouse gas emissions have on climatic factors, it is necessary to relate them to the SPSS program. Thus, from the two graphs presented below, namely Figures 10-11, one can observe two dependent variables represented by the sum of the degrees and the sum of the precipitations and an independent variable represented by the greenhouse gas emissions for both graphs.

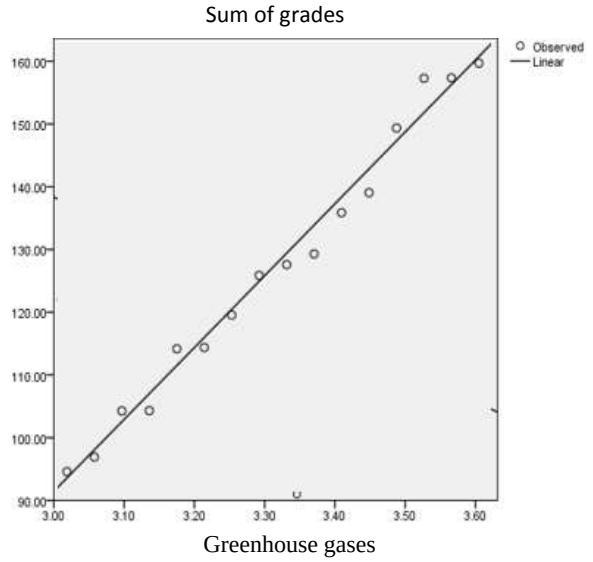

Fig.10. Evolution of annual average temperatures to greenhouse gas emissions variation in North East
Source: processing of statistical data in SPSS.

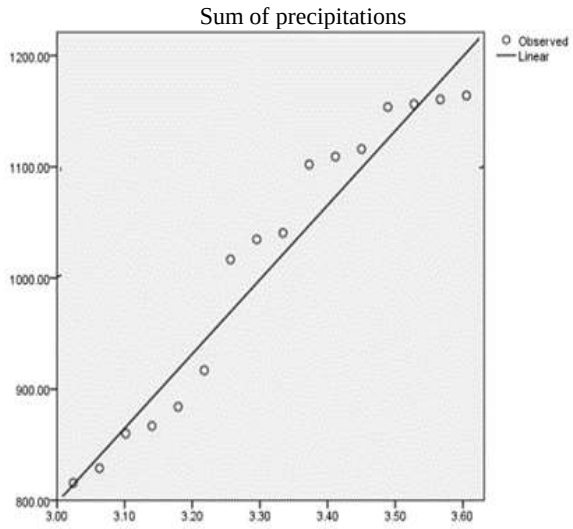

Fig. 11. Evolution of annual average rainfall according to the variation of greenhouse gas emissions in the North East Region
Source: processing of statistical data in SPSS.

According to the simple linear regression analysis model using the SPSS calculation program results a close relationship between the two variables analysed in Fig. 10, demonstrating that annual average temperatures are influenced by greenhouse gas emissions from agriculture, with a correlation of 0.523.
As for the relationship between precipitation and greenhouse gases, a correlation of 0.346 results, which shows that the precipitation falling in the North East region is largely influenced by the quantity of these gases, so climate factors are influenced directly by greenhouse gases produced by the agricultural sector.

CONCLUSIONS

On the basis of the analysed, we can observe the changes in the temperature and the rainfall in the North-East region, they can be perceived as climatic changes, mainly due to the activities that man performs.
Their effect is seen in the yield of rapeseed production, which demonstrates that the agricultural sector is one of the most exposed economic sectors of a country that can be negatively affected by these changes, and

agriculture is directly dependent on climatic factors.

Climate change is directly or indirectly attributable to human activity, as mentioned earlier, the root cause of climate change being the increase in greenhouse gas emissions from various economic sectors of a state.

The agricultural sector is one of the condominiums producing greenhouse gases, so millions of tons of carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), Pirhoyd HFC , PFC, sulfur oxide (SF6), nitrogen fluoride (NF3), accounting for about 9.6% of the total greenhouse gas emissions produced by all economic sectors. As a result, there is a mutual relationship between agriculture and climate change and they influence each other, it can be said that agriculture plays a double role, being both a responsible part of climate change and the victim of climate change. Climate change is a challenge for agriculture, which has to adapt [1] by creating drought-resistant varieties, building irrigation facilities, growing plants with resistance to diseases and pests favoured by increased humidity or high temperatures, building of garbage storage platforms segregated manure, storage of rubbish in cool and shady places, and covering of liquid waste basins.

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[8]Eurostat Statististics Explaine, File:Figure 1 Contribution of agriculture to total GHG emissions (%), EU-28, 2015.png; https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Figure_1_Contribution_of_agriculture_to_total_GHG_emissions_(%25),_EU-28,_2015.png, Accessed Mar. 6, 2019.
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THE RESEARCH ON THE CHEMICAL CONTROL OF THE *OSTRINIA NUBILALIS*, IN NATURAL AND ARTIFICIAL INFESTATION CONDITIONS, IMPORTANT LINK IN INTEGRATED PEST MANAGEMENT

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Abstract

At present, the most important anthropod pest of the maize in Europe is the European corn borer, Ostrinia nubilalis Hbn. In the infested areas, O. nubilalis is found with great frequency, starting from 20% in Hungary to 60% in Spain, and estimated production losses are between 5% and 30%, being considered as typical losses without too many control measures. Due to the major importance of this pest, between 2013 and 2016, at SCDA Turda the effect of some insecticides has been tested during the treatments on vegetation for corn borer control, under conditions of natural and artificial infestation with Ostrinia nubilalis. The most efficient role in the protection of maize culture, and implicitly of production, goes to the active substances indoxacarb and deltamethrine, in both infestation conditions, leading to very significant increase compared to the test counterpart. The least efficient results for corn borer control were obtained with the active substance thiacloprid.

Key words**:** *corn, Ostrinia nubilalis, natural and artificial infection, treatmets*

INTRODUCTION

At present, the most important anthropod pest of the maize in Europe is the European corn borer, *Ostrinia nubilalis* Hbn. In the infested areas, *O. nubilalis* is found with great frequency, starting from 20% in Hungary to 60% in Spain, and estimated production losses are between 5% and 30%, being considered as typical losses without too many control measures. France and Spain have registered additional economic damages due to the Mediterranean corn borer *Sesamia nonagrioides* Lefèbvre [8]. It is estimated that between 2 and 4 million hectares of maize in Europe have registered economic damages due to these pests [Brookes, 2009 quote by 8]. The damages caused by *Ostrinia nubilalis* Hbn. in the corn field can be direct, through the reduction of the crop biological yield of the plants and indirect, as vector of pathogens for corn-smuts and fusarioses and for plant blight and fall, the contamination with fumonisin in temperate zones [2, 4, 5, 9, 10, 12]. Corn borer control is based mainly on preventive measures such as the cultivation of resistant genotypes and the diminuation of biological reserve from nature. Alongside the genetic resistance to the corn borer, chemical control or at least the reduction of the number of individuals through chemical methods are technological measures of great importance. At present, different active substances are available: azadirachtin and indoxacarb [13], as well as bacterial (*Bacillus thuringiensis*, Bt) and biological (*Trichogramma parasites*) control methods against the corn borer.

MATERIALS AND METHODS

Due to the major importance of this pest, between 2013 and 2016, at SCDA Turda the effect of some insecticides has been tested during the treatments on vegetation for corn borer control, under conditions of natural and artificial infestation with *Ostrinia nubilalis*.

The artificial infestations were carried out with eggs of *Ostrinia* originating from INCDA Fundulea, produced under laboratory conditions, according to a technology described by Bărbulescu (1980) [2].

The experiment has been arranged according to the method of randomized complete block design with four repetitions, and the plant material used was the hybrid Turda Star. The composition of the experience was made up of the following factors:

-Factor A– the year, with two situations investigated

-Factor B– the infestation method, with two situations investigated

Factor C– treatments (Table 1), with five situations investigated.

Table 1. The insecticides used to treat corn in vegetation at Turda 2013 and 2016

Insecticide	Spectrum of control	Dose	Action mode
Calypso 480 SC tiacloprid 480 g/l	*Tanymecus dilaticollis*	0.9 l/ha	systemic insecticide, acts by contact and ingestion;
Decis Mega 50 EW deltametrin 50 g/l	*Diabrotica virgifera virgifera*	0.25 l/ha	foliar pyrethroid insecticide acts by contact and ingestion of harmful insects in the larvae or adults;
	Tanymecus dilaticollis	0.15 l/ha	
Avaunt 150 SC indoxacarb 150 g/l	*Ostrinia nubilalis*	0.25 l/ha	insecticide that acts through contact and ingestion;
Actara 25 WG thiametoxam 25%	*Tanymecus dilaticollis*	100 g/ha	systemic insecticide with long lasting effect that combats, through contact and ingestion, the pests in both the larval and adult stages.

Source: [7].

With the purpose of diminuating crop damage caused by the corn borer through the application of some treatments on plants, some observations have been made in the field, before harvesting, in two infestation conditions (natural and artificial), having followed some parameters of attack of this pest on 20 infested and 20 uninfested plants:

-the number of plants affected by variant

-the length of plant galeries

-the evaluation of the attack on the plant

Starting from the observations made, the frequency and the intensity of the attack on the plant were determined in the laboratory. From these parameters, the degree of the attack on the variant was determined.

The intensity of the attack (I %) in fact refers to the percentage of plant, of foliage or of other parts of the plant destroyed by the pest.

As this parameter is often subjective [1], marks were given on a scale 1-9, described by Hudon and Chiang, (1991) [6]: 1 for intact plants, 2 for pierced panicle, 3 for plant broken directly under the panicle, 4 for plant broken under the panicle but not farther than the first knot, 5 for plant broken under the panicle but not farther than the second knot, 6 for plant broken under the panicle but not farther than the third knot, 7 for plant broken under the panicle but not farther than the fourth knot, 8 for plant broken above the cob and 9 for fallen cob or plant broken under the cob.

According to this scale:

$$I\% = \sum(I * f)/n,$$

where:

I – the mark given

f – the number of plants affected for each mark

n – total number of analyzed plants.

The degree of attack (GA) is obtained by multiplying the frequency of the attack (F%) with the intensity of the attack (I%) [3]:

GA = F * I/100.

Production (kg/ha) has been corrected for the standard humidity of 14%.

The data expressed in percentage have been transformed into arcsin√% so that the discontinuous values expressed in percents can be transformed into a string of continuous variation which can be subjected to the

analysis of variance. Production was expressed in kg/ha for the statistical processing and in t/ha for the graphical representation.
The data obtained through note-taking in the field have been processed through the Excel program. Experimental data have been processed through the program Polifact.

RESULTS AND DISCUSSIONS

The analysis of variance shows the very significant implication of the three factors: year, method and treatment in expressing the frequency of attacks on the plant (Table 2).

Table 2. The variance analysis for the attack frequency of *Ostrinia nubilalis* on plant in the testing of some insecticides, Turda 2013 and 2016

Source of variation	DF	s^2	F Test
Total	70		
Year (Y)	1	1,145,42	179.30***
Method (M)	1	1,257,78	113.52***
Treatment (T)	4	6,815,28	701.14***
M x T	4	161.96	16.66***
Error A	3	6.39	
Error M	6	11.08	
Error T	48	9.72	

Source: [7].

A much more reduced contribution in the occurence of the variance of the frequency of attacks on the plant can also be observed in the interaction method x treatment, which suggests the existence of differences between the treatment variants and obviously the infestation method.
The occurence of the frequency of attack on the plant is considerably influenced by the year of cultivation.
Thus, it has been noticed that in 2016 this attack parameter has registered significantly positive values, of approximately 71%.
Even if some pest eggs are destroyed through the intervention of certain factors (biological – *Coccinella septempunctata*, climatic – strong wid, heavy rainfall, insolation), nevertheless, artificial infestation leads to a growth of attack on the plant with over 10%.

Table 3. The factors influence on the attack frequency of *Ostrinia nubilalis* on plant in the testing of some insecticides, in conditions of natural and artificial infestation, Turda 2013 and 2016

Factors		Attack frequency on plant		Difference to control	Significance
		%	arcsin √%		
A. Year	Average	64.8	53.61	0.00	Mt.
	2013	58.4	49.83	-3.78	00
	2016	71.0	57.40	3.79	**
	LSD (p 5%) = 1.80 LSD (p 1%) = 3.30 LSD (p 0.1%) = 7.31				
B. Infestation method	Natural	58.1	49.65	0.00	Mt.
	Artificial	71.3	57.58	7.93	***
	LSD (p 5%) = 1.82 LSD (p 1%) = 2.76 LSD (p 0.1%) = 4.44				
C. Treatment	Untreated	97.7	81.16	0.00	Mt.
	Tiacloprid	80.4	63.71	-17.46	000
	Deltametrin	37.9	38.02	-43.14	000
	Indoxacarb	23.8	29.23	-51.93	000
	Thiametoxam	68.6	55.95	-25.21	000
	LSD (p 5%) = 2.22 LSD (p 1%) = 2.96 LSD (p 0.1%) = 3.86				

Source: [7].

From among the substances used, it seems that indoxacarb (Avaunt 150 SC) in doses of 0.25 l p.c./ha have reduced the most the frequency of the attack on the plant, while the second place goes to deltamethrine (Decis Mega 50 EW) used in the same dose. The most reduced influence on the control of the level of the corn borer population and implicitly on the frequency of the attack on the plant has been attributed to thiacloprid (Calypso 480 SC).(Table 3).

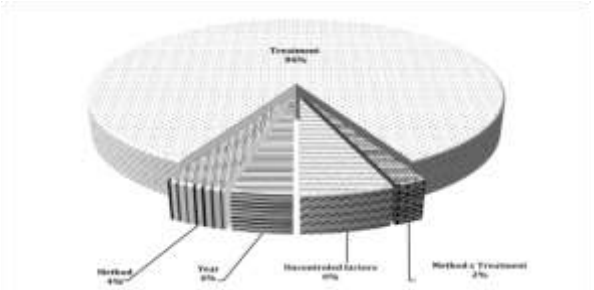

Fig. 1. The participation rate (%) of some factors implicated in the attack frequency of *Ostrinia nubilalis* on plant, in conditions of natural and artificial infestation, Turda 2013 and 2016
Source: [7].

A more suggestive representation regarding the contribution of factors in the variance of the frequency of attack on the plant can be seen in Figure 1. Treatment has the most

implication in controlling this parameter, of approximately 84%.

The contribution of the year and of the infestation method is much more reduced compared to the one of the treatment, only 4%, which suggests the importance of treatment in controlling this pest.

Under both infestation circumstances, the application of insecticides leads to an important reduction of the number of plants attacked by *Ostrinia nubilalis* (Fig. 2), and the most reduced frequency of attacked plants has been recorded after using indoxacarb (Avaunt 150 SC), with differences between 48-56% compared with the test counterpart. The most inefficient results in corn borer control have been obtained with thiacloprid (Calypso 480 SC).

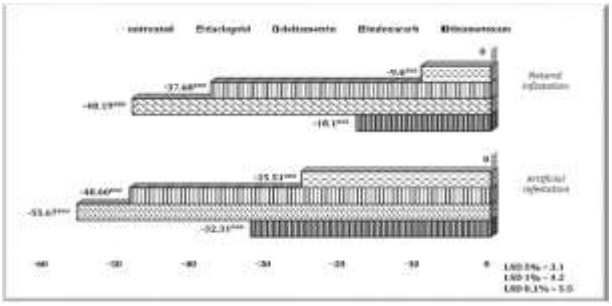

Fig. 2. The influence of treatment x method interaction on the attack frequency of *Ostrinia nubilalis* on plant in the testing of some insecticides, 2013 and 2016
Source: [7].

It seems that the degree of attack, as well as the frequency of attack on the plant are the most influenced by the treatment factor, after the method and the year. The values of sample F (Table 4) similarly indicate in the case of the interaction method x treatment a very significant influence on the degree of attack.

Table 4. The variance analysis for the degree of attack produced by *Ostrinia nubilalis* (arcsin√%) in the testing of some insecticides, Turda 2013 and 2016

Source of variation	DF	s^2	F Test
Total	70		
Year (Y)	1	60.83	170.07***
Method (M)	1	81.69	428.92***
Treatment (T)	4	367.48	4,364.12***
M x T	4	0.72	8.60***
Error A	3	0.36	
Error M	6	0.19	
Error T	48	0.08	

Source: [7].

As shown in Figure 3, a considerable reduction, with very significantly negative differences, of the degree of attack is noticeable in both conditions of infestation, following the use of the active substance indoxacarb (Avaunt 150 SC). Deltamethrine (Decis Mega 50 EW) is placed second, with important limitations, close to the ones for the active substance indoxacarb. We can state that the other substances also have their contribution to the limitation of the degree of attack, but with relative values, noticeably smaller in comparison with indoxacarb.

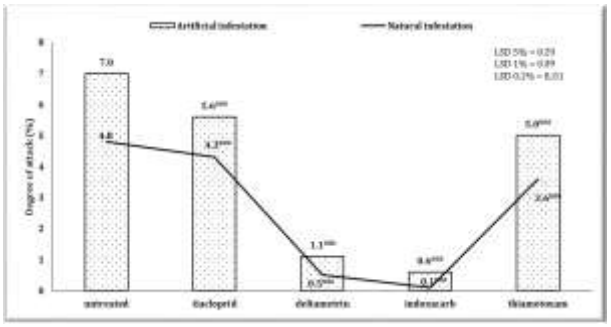

Fig. 3. The influence of treatment x method interaction on degree of attack in the testing of some insecticides, 2013 and 2016
Source: [7].

The reduction of the the degree of attack is obviously due to the efficiency of the insecticide used. The efficiency has been calculated based on the medium values of the degree of attack from the two infestation methods. As it can be seen in Table 5, the best results in corn borer control are due to the active substances, indoxacarb (Avaunt 150 SC) and deltamethrine (Decis Mega 50 EW), with 90 %, respectively 85 % efficiency.

Table 5. The effectiveness of some insecticides used in vegetation treatments in the control of *Ostrinia nubilalis* Hbn., Turda 2013 and 2016

Crt. no.	Active substance	Dose (ml p.c./ha)	DA (%) average	E (%) average
1.	tiacloprid	150	5.0	15.0
2.	deltametrin	250	0.9	85.0
3.	indoxacarb	250	0.4	90.0
4.	thiametoxam	100 g/ha	4.3	27.0
5.	untreated	-	5.9	-

Legend: DA – degree of attack, E – efficacity
Source: [7].

As concluded from the analysis of variance, gallery length is considerably influenced by the infestation method, followed by the environmental factor. An important contribution to gallery length is due to the treatment factor. The interaction between the factors also essentially contributes to the fluctuations in gallery length (Table 6).

Table 6. The variance analysis for the tunnel length (cm) produced by *Ostrinia nubilalis* in the testing of some insecticides, Turda 2013 and 2016

Source of variation	DF	s^2	F Test
Total	70		
Year (Y)	1	4,084.08	2,271.04***
Method (M)	1	4,767.87	4,028.34***
Treatment (T)	4	3,232.70	3,908.85***
M x T	4	726.60	878.57***
Error A	3	1.80	
Error M	6	1.18	
Error T	48	0.83	

Source: [7].

Similarly to the other attack parameters, the most efficient results in reducing the length of the galleries produced by the corn borer (Table 7), have been obtained with the active substances indoxacarb (Avaunt 150 SC) (30 cm) and deltamethrine (Decis Mega 50 EW) (28 cm) compared to the test counterpart. In fact, all the treatments limit up to a certain point this attack parameter.

Table 7. The factors influence on the tunnel lenght in the testing of some insecticides, in conditions of natural and artificial infestation, Turda 2013 and 2016

Factors		Tunnel lenght (cm)	Difference to control	Significance
A. Year	Average	17.54	0.00	Mt.
	2013	10.40	-7.15	000
	2016	24.69	7.15	***
	LSD (p 5%) = 0.95 LSD (p 1%) = 1.75 LSD (p 0.1%) = 3.88			
B. Infestation method	Natural	9.82	0.00	Mt.
	Artificial	25.26	15.44	***
	LSD (p 5%) = 0.60 LSD (p 1%) = 0.90 LSD (p 0.1%) =1.45			
C. Treatment	Untreated	31.65	0.00	Mt.
	Tiacloprid	30.69	-0.96	00
	Deltametrin	3.94	-27.71	000
	Indoxacarb	1.83	-29.83	000
	Thiametoxam	19.60	-12.05	000
	LSD (p 5%) = 0.65 LSD (p 1%) = 0.86 LSD (p 0.1%) = 1.13			

Source: [7].

The most inefficient proved to be thiacloprid (Calypso 480 SC) (1 cm) şi thiametoxam (Actara 25 WG) (12 cm).

Among the treatments, indoxacarb (Avaunt 150 SC) ensures the best protection for the maize, expressed through reducing gallery length. This active substance leads to a limitation of this parameter with up to 44% compared to the untreated variant (the test counterpart), even under conditions of high level of infestation. Under natural conditions of infestation, the usage of this substance limits the damage caused by the corn borer through gallery length with almost 16% compared to the test counterpart (Figure 4).

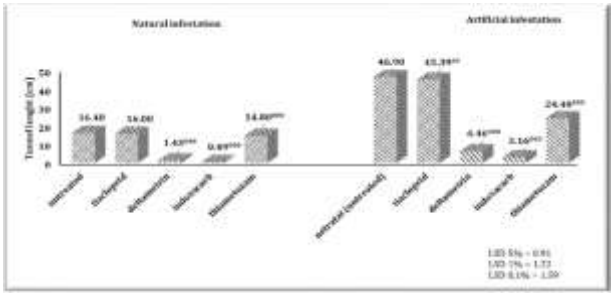

Fig. 4. The influence of treatment x method interaction on the tunnel lenght In the testing of some insecticides, 2013 and 2016
Source: [7].

The usage of these active substances limits the attack parameters of the corn borer in different proportions, the active substances indoxacarb şi deltamethrine (Decis Mega 50 EW) being the most efficient. We can highly recommend that the usage of these two products will considerably reduce the attack of *Ostrinia nubilalis* Hbn.

Production, as the final result of all the metabolic processes which take place in the plant, is highly complex and subject to the action of several abiotic and biotic stress factors, which finally contribute to the quantity and quality of production. Thus, we can say that production is in an extremely fragile balance with the great number of stress factors which can tip this balance any time in one or the other direction.

The tightest possible molding of all the technological links and pedoclimatic conditions on the requirements of the biological factor (hybrid) is one of the main

conditions for inclining the „production" factor in a positive direction. In this regard, it is more and more necessary to apply the insecticides on the vegetation in maize cultivation for reducing the crop losses caused by *Ostrinia nubilalis.* The present experiment has had for its main purpose the identification, from among the existing insecticides, of those ones which have minimal impact on the environment, but at the same time significantly limit crop losses caused by the corn borer.

The genetic factor on which this experiment is based is the hybrid Turda Star, which was tested in two years of cultivation, under the same technological conditions (seed treatment, quantities of fertilizer, sowing density, herbicide and precursor plant). The most significant impact on maize production was the year factor, followed by method and treatment (Table 8). The interactions between the factors do not contribute significantly to production variance, with the exception of the double interaction year x method, 2016 was one of the most favourable years for maize culture, at least in the area where the experiment was carried out.

Table 8. The variance analysis for the mean production (kg/ha) obtained in the testing of some insecticides, Turda 2013 and 2016

Source of variation	DF	s^2	F Test
Total (Total)	79		
An (A) Year (Y)	1	84,542,720	1,410.27***
Method (M)	1	5,156,201	47.47***
Treatment (T)	4	2,292,888	19.67***
A x M	1	1,279,674	11.78***
A x T	4	170,172.6	1.46
M x T	4	248,770.5	2.13
Error A	3	59,947.9	
Error M	6	108,614.6	
Error T	48	116,570.4	

Source: [7].

Notable differences have been recorded for the two years of research, of 1,000 kg/ha (Table 9).

Obviously, artificial infestation with pest eggs led to important reductions in production, on the average 600 kg. From among the treatments, in the case of production, too, the most efficient substance was indoxacarb (Avaunt 150 SC). The most efficient substances in protecting the maize culture and implicitly production have proved to be indoxacarb şi deltamethrine (Decis Mega 50 EW), in both infesation conditions, leading to significant increase compared to the test counterpart.

Table 9. The factors influence on the mean production in the testing of some insecticides, in conditions of natural and artificial infestation, Turda 2013 and 2016

Factors		Mean production (kg/ha)	Difference to control	Significance
A. Year	Average	7,892	0.00	Mt.
	2013	6,866	-1,026.11	000
	2016	8,918	1,026.11	***
	LSD (p 5%) = 193.48 LSD (p 1%) = 355.32 LSD (p 0.1%) = 787.31			
B. Infestation method	Natural	8,180	0.00	Mt.
	Artificial	7,603	-577.48	000
	LSD (p 5%) = 164.69 LSD (p 1%) = 249.38 LSD (p 0.1%) = 400.63			
C. Treatment	Untreated	7,458	0.00	Mt.
	Tiacloprid	7,542	84.13	-
	Deltametrin	8,218	759.38	***
	Indoxacarb	8,446	987.81	***
	Thiametoxam	7,794	335.63	**
	LSD (p 5%) = 211.59 LSD (p 1%) = 282.54 LSD (p 0.1%) = 368.65			

Source: [7].

Under conditions of natural infestation, experiment results show that the active substance thiametoxam also ensures significant protection for maize production, leading to increase with 300 kg/ha comapred to the test counterpart. At great infestation pressure, nevertheless, this substance reacts less and ensures insignificant increase compared to the test counterpart (Fig. 5).

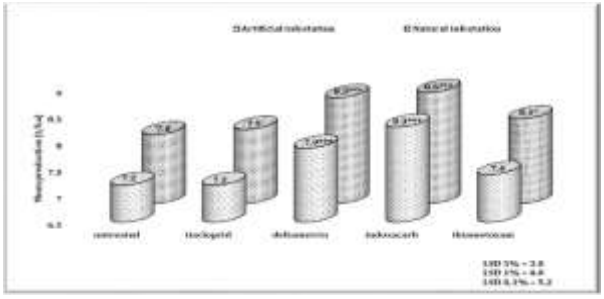

Fig. 5. The influence of treatment x method interaction on the mean production in the testing of some insecticides, 2013 and 2016
Source: [7].

The active substance indoxacarb (Avaunt 150 SC) ensures the best production increase, both in low or high degree infestation conditions.

For example, in natural infestations, the average differences compared to the test counterpart are 850 kg/ha (Fig. 6). The reference price for maize in the last years was 0.5-0.6 lei/kg, and by multiplying the average price with the production rate, compared to the test counterpart, we get an extra value of 470 lei/ha. By subtracting the price of the insecticide and of petrol, the profit amounts to 200 lei/ha. These simple calculations reflect the importance of using this product which, supported by suitable technology, can lead to important financial increase.

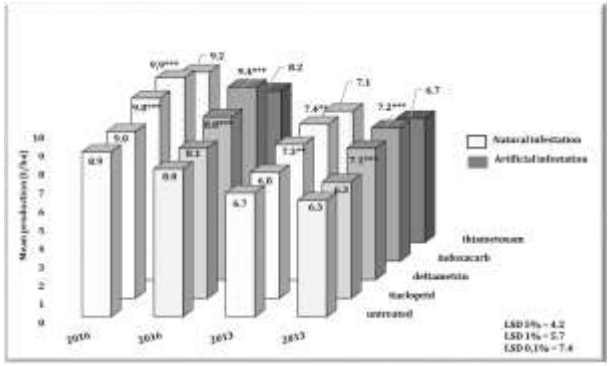

Fig. 6. The influence of treatment x year x method interaction on the mean production in the testing of some insecticides, 2013 and 2016
Source: [7].

The relationship between the degree of attack and average production, under both infestation conditions, is indirect and almost in all cases, significant.

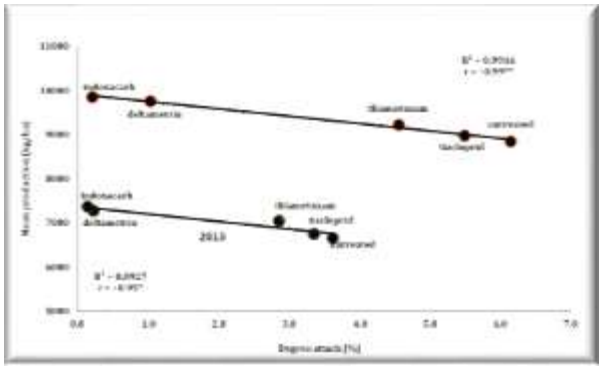

Fig. 7. Regression between mean production and degree of attack, in conditions of natural infestation
Source: [7]

Under conditions of natural infestation, the reduction of the regression line is obvious (Fig. 7), indicating the reduction of the degree of attack compared to the values of this indicator, but at higher pressures of infestation.

Nevertheless, the usage of insecticides somehow limits the degree of attack even under conditions of artificial infestation, but below the threshold of 7% (Figure 8). Under the natural infestation conditions from 2016, productions are much closer to the regression line, suggesting more reduced fluctuations of the productions (Fig.7).

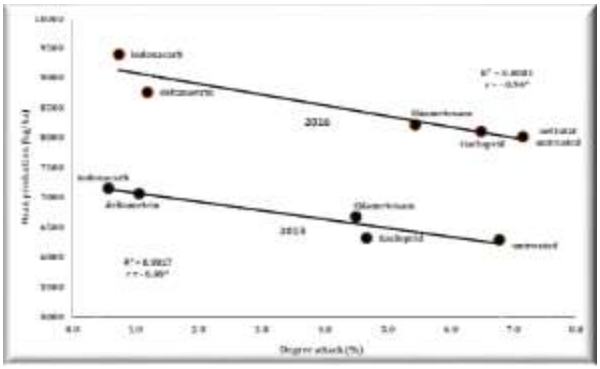

Fig. 8. Regression between mean production and degree of attack, in conditions of artificial infestation
Source: [7].

All the attack parameters of this pest finally lead to important crop losses. Following some thorough studies conducted in Câmpia Dunării in 1971, it was concluded that a single larva would produce a loss of 20 g/plant. Through simple calculations, implying plant density, one can get to production losses of 1,200 kg/ha [11].

Genetic resistance to *Ostrinia nubilalis* and the reduction of the number of broken plants has seen real progress only at genetically modified organisms. Until this objective is reached, for the protection of maize cultures it is necessary to strictly obey the technological chains, together with the execution of chemical treatments on vegetation with one of the active substances, indoxacarb or deltamethrine, especially when the pressures of infection grow, as well as in situations when some technological chains are not followed.

CONCLUSIONS

The most efficient role in the protection of maize culture, and implicitly of production, goes to the active substances indoxacarb and deltamethrine, in both infestation conditions, leading to very significant increase compared to the test counterpart.

The least efficient results for corn borer control were obtained with the active substance thiacloprid.

Genetic resistance to *Ostrinia nubilalis* and the reduction of the number of broken plants has seen real progress only at genetically modified organisms. Until this objective is reached, for the protection of maize cultures it is necessary to strictly obey the technological chains, together with the execution of chemical treatments on vegetation with one of the active substances, indoxacarb or deltamethrine, especially when the pressures of infection grow, as well as in situations when some technological chains are not followed.

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DEMOGRAPHIC ANALYSIS OF THE BUCHAREST-ILFOV REGION

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Abstract

Demographic studies are key programs and development strategies needed for economic and social development. The purpose of the present paper is to carry out a study of research, based on analysis and of interpretation of statistical data provided mainly by the Romanian National Institute of Statistics, corroborated of course with theoretical aspects that allowed the evaluation of regional information on population structure in Bucharest-Ilfov. The population of the Bucharest-Ilfov region totaling a number of 2,301,255 inhabitants in 2018 is distributed inversely proportional to the size of the two administrative entities namely Bucharest, which is the capital of Romania and Ilfov County. Bucharest is the largest urban agglomeration in Romania, and has a population of 1,827,810 inhabitants, which represents about 80% of the region's population, the equivalent of more than 17.4% of the country's urban population, or about 12% of the total population of Romania, having a density of approximately 7,679.87 people / km².

Key words: *Bucharest-Ilfov region, population, demographic study, demographic projection*

INTRODUCTION

As in other areas of statistics, in the field of population statistics have made changes and transformations, both in terms of the system and the content of indicators used in practice [11].

Making demographic studies reprezents key programs and development strategies needed for economic and social development. Such a regional study is used to define and develop sectoral options and programs in the economic, social, educational, health, transport, tourism, etc.

The pronounced decline of the population due to its aging, the decrease in fertility and the presence of migration are demographic phenomena registered in all developed countries. According to statistics, these phenomena will intensify in the coming period and will generate multiple effects on society.

In order to substantiate economic and social development programs it is necessary to know the evolution of labor resources and labor force analysis is very important because is impacting these phenomena and at the same time they must be brought to the attention of policy makers in order to prevent the negative effects of these demographic processes.

The purpose of the draw up of this paper is, based on data provided by the National Institute of Statistics, the regional evaluation of the population information in the Bucharest-Ilfov region.

MATERIALS AND METHODS

The data was collected through public institutions, including the National Institute of Statistics and Statistics of Ilfov County.

The study was of research, analysis and interpretation of statistical data. This, combined with extracts from theoretical literature, allowed the evaluation of regional information on population structure in Bucharest-Ilfov.

RESULTS AND DISCUSSIONS

Composed from Bucharest - the capital of Romania - and Ilfov County, the Bucharest-Ilfov region is located in the south, in the central part of the Romanian Plain, about 100

km south of the Carpathian Mountains, 200 km from the sea and 60 km away from the Danube [5]. This region is atypical to the other 7 regions of Romania, Bucharest being surrounded by Ilfov County, [2] and the two parts of this region (Bucharest, Ilfov County) have very different characteristics.

With a total area of 1,821 square kilometers, of which Bucharest occupies 13.1%, and Ilfov County 86.9%, the Bucharest-Ilfov development region borders the South-Muntenia region, being surrounded by this region in all the cardinal points. [1] Bucharest and Ilfov County are the smallest territorial administrative units in Romania in terms of area [9].

In the Bucharest-Ilfov region there is a landscape where the valleys of rivers crossing the region intersect the numerous natural and artificial lakes [6].

Table 1. Overview of the population and area of the Bucharest-Ilfov region

	Bucharest-Ilfov region	Bucharest	Ilfov County
Surface (km^2)	1,821	238	1,583
Population	2,301,255	1,827,810	473,445
Population density	1,263.73	7,679.87	299.08
Urban population (%)	88.66	100	44.88
Rural population (%)	11.34	0	55.12
Population by gender and urban-rural environment			
Male	1,080,888	849,227	231,661
Female	1,220,367	978,583	241,784
Both sexes - Urban	2,040,308	1,827,810	212,498
Male	952,104	849,227	102,877
Female	1,088,204	109,621	978,583
Both sexes - Rural	260,947	0	260,947
Men	128,784	0	128,784
Female	132,163	0	132,163

Source: National Institute of Statistics - TEMPO-Online, Accessed on 04.2019 [8].

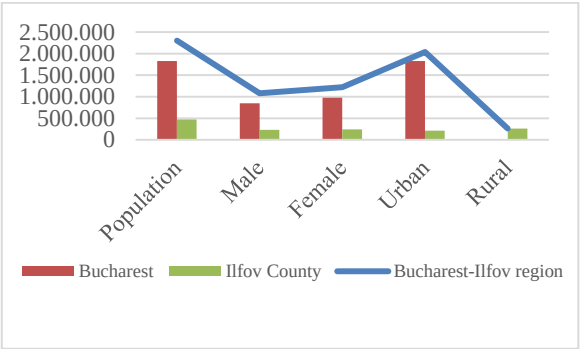

Fig. 1. Distribution of population in the region by number, gender and residence area
Source: National Institute of Statistics - TEMPO-Online, Accessed on 04.2019 [8].

The Bucharest-Ilfov region had a population equal to 2,301,255 people in 2017, which were distributed inversely proportional to the surfaces of the two administrative entities, [3] because although the Bucharest Municipality has a smaller area than Ilfov County, it is the largest urban agglomeration in Romania, its population being 1,827. 810 inhabitants (representing 79.42% of the total population of the Bucharest-Ilfov region, 17.4% of the urban population of Romania and over 12% of the country's total population) having a density of over 7,679.87 inhabitants / km^2.

The population of Ilfov County equals 467,080 inhabitants (20% from the Bucharest-Ilfov region), and the county's density is 295 inhabitants per km^2.

Table 2 provides information on population trends over the period 2013-2018 in population distribution by age group.

It can be noticed that, during the analysed period, the number of the population registered increases, especially between 2013-2016, the year 2017 being distinguished by the fact that the number of the population registered decreases.

Regarding the distribution of the population by age groups, both at the level of the group 0-14 years and at the level of the group over 60 years, there have been increases, while at the level of the group 15-59 years, starting with the reference year, respectively the year 2013 saw continuous decreases.

Table 2. Population by age group, in Bucharest-Ilfov Region, year 2018

Years	Number of people	Age groups		
		0-14 years	15-59 years	Over 60 years
2013	2,282,244	305,828	1,512,012	464,404
2014	2,283,413	310,140	1,496,772	476,501
2015	2,284,443	317,316	1,477,802	489,325
2016	2,288,203	323,948	1,461,591	502,664
2017	2,287,347	331,784	1,443,687	511,876
2018	2,301,255	340,857	1,437,015	523,383

Source: National Institute of Statistics - TEMPO-Online, Accessed on 04.2019, [8].

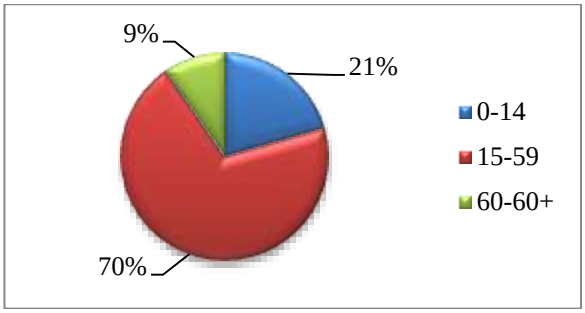

Fig 2. Distribution of population by age group in the Bucharest-Ilfov region in 2018
Source: National Institute of Statistics - TEMPO-Online, Accessed on 04.2019 [8].

Although the population of Romania is in continuous numerical decline, [12] a process that has been installed after 1990, as a result of the change in the demographic policy existing at that time and the population growth rate, characterized by a continuous decrease after the 1977 census, the population registering more and more negative values from 1992 [11], in the period 2013-2018, with respect to the population of the Bucharest-Ilfov region, classified by age group, we can observe that, contrary to the general trend of decrease of the population in the rest of the country, there is an increase of 0.8% in the Bucharest-Ilfov Region.

Even if it shows an upward trend, the population of the Bucharest-Ilfov region rising in each of the six years analyzed, the fact that the population aged 60 years and over is the largest, increasing in 2018 compared to 2013 with over 12.7%, leads to the aging phenomenon of the population, [4] present both at national level and at the level of the whole European Union.

Table 3. Movement of internal migration with the change of residence in Bucharest-Ilfov Region

	2012	2013	2014	2015	2016	2017
Bucharest-Ilfov region						
Arrivals	69,790	66,322	71,763	69,430	75,720	87,299
Departures	65,852	67,013	63,695	57,499	62,283	61,143
Balance of internal migration	3,938	-691	8,068	11,931	13,437	26,156
Bucharest						
Arrivals	52,383	49,539	52,271	49,463	52,979	64,645
Departures	60,900	62,198	57,745	51,074	55,060	53,172
Balance of internal migration	-8,517	-12,659	-5,474	-1,611	-2,081	11,473
Ilfov County						
Arrivals	17,407	16,783	19,492	19,967	22,741	22,654
Departures	4,952	4,815	5,950	6,425	7,223	7,971
Balance of internal migration	12,455	11,968	13,542	13,542	15,518	14,683

Source: National Institute of Statistics - TEMPO-Online, Accessed on 04.2019 [8].

The number of people aged 0 to 14 also increases by more than 11.45%, but the total number of people aged 15-59 is less than 5% lower. Due to these fluctuations in the number of registered persons over the analyzed period, we can say that, although the population has a positive trend, the aging of the population is more significant than the increase in the birth rate and the segment of young people, [7] so that all will lead to a demographic decline.

The phenomena emerging from the analysis of the data in Table 2, respectivly the aging of population through increased life expectancy and the decrease in the birth rate, are two different processes.

These cumulate with the decrease of the sector of people paying contributions to the

state lead slowly but surely to the migration of the population to other states.

Romania continues to be a country of emigration, the phenomenon of emigration being the second main cause of the country's population decline. The balance of international migration in 2017 was negative, the number of migrants exceeding the number of immigrants with over 53 thousand people. [8]

Regarding the demography of the Bucharest-Ilfov region, migration plays a very important role, both internal and external migration. During the analyzed period, according to the data included in Table 3, a positive balance of population migration was registered over the period 2012-2017, and this is due to the increase in the number of people who have settled their residence within the region by 25% and the drop in the number of people who left the region by almost 8%. In Bucharest, in the first years of the period analyzed, the migratory balance was a negative one, but in 2017, the last one taken into account, the balance of internal migration is positive, but although the indicator analyzed was positive, the total analyzed period remains negative, as in the first 5 years of the reference period. This negative balance of internal migration registered in Bucharest may be due to the fact that, in an attempt to avoid the largest urban agglomeration in the country, the families change their domicile with one of the counties surrounding the city. In contrast to Bucharest, in Ilfov County, it can be observed that in each analyzed year, as well as in the total analyzed period, the balance of internal migration is positive and increased in 2017 as compared to 2012 by almost 18 percent, despite the fact that the number of people leaving the county is higher every year, increasing by over 61%. The situation resulting in the Bucharest-Ilfov region is due to the fact that, as I mentioned, a large proportion of people living in Bucharest migrate to Ilfov County for a more peaceful and less polluted living, and the inhabitants of Ilfov County migrate to Bucharest for the realization of higher incomes, but most often leave the country for a more decent life.

Table 4. Changes in residence per development region in the period 2007-2017 - rate per 1,000 inhabitants

	Year 2007		Year 2010		Year 2013		Year 2017	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
North-West Region	42.1	41.3	51.5	49.0	39.2	37.0	44.6	41.4
Central Region	40.6	40.7	45.6	45.9	34.5	34.4	39.2	37.8
North-East Region	58.6	65.2	70.8	76.6	63.0	59.6	60.8	65.2
South-East Region	48.1	49.5	52.5	56.0	39.6	42.8	42.2	48.7
South-Muntenia Region	57.4	56.9	62.9	65.7	45.8	49.1	47.0	54.5
Bucharest-Ilfov Region	45.0	39.5	84.1	73.7	63.3	60.9	73.9	57.1
South-West Region	43.4	46.3	47.4	51.4	32.5	35.9	33.5	39.0
West Region	39.1	34.7	44.2	40.8	32.7	30.9	39.0	36.4

Source: National Institute of Statistics - TEMPO-Online, Accessed on 04.2019 [8].

By comparing with the rest of the development regions in the country, in the rest of the years apart from 2017, the migratory flows of the Bucharest-Ilfov region are the most pronounced. This is due to the fact that Bucharest, being the capital of Romania, attracts a large number of people who choose to live there in order to earn higher income or to continue their studies after graduation, leading to an increased number of arrivals. However, there is also the opposite side of the coin because, in the same way that there is a large number of arrivals, the Bucharest-Ilfov region also has a large number of departures, largely due to people migrating to other states in search of a living more decent or those who, when finalizing their studies, return to their native regions.

It is worrying that, according to the Territorial Development Strategy of Romania, in the above-mentioned conditions have in 2050 18.5 million inhabitants. Whatever the predicted value, there is a common denominator: a sharp drop in population [10].

Birth rate has not been so low since 1967, the year following the decree given by Nicolae Ceausescu, which decreed abortions and contraceptive methods. According to data from the Romanian Academy and fron the National Institute of Statistics, every year between 1970 and 1989, 360 thousand children were born, on average. Since 1990 the birth rate has dropped almost continuously.

CONCLUSIONS

Demographics and demographic statistics are currently based on modern scientific methods and are useful in explaining complex socio-economic phenomena at both macro and micro-social levels.

During the analyzed period, in the Bucharest-Ilfov region are present the same phenomena are encountered at national level as well as at the European level, respectively the tendency of population aging, which is materialized by lowering the natality rate, ie the decrease of the number of people with ages between 0 and 14 and the increase in the total number of people aged 60 and over, and this demographic aging has important consequences over time such as the increase in the number of retirees and the decrease in the number of active persons that support the state by paying contributions wich lead to major imbalances in the labor market.

However, taking into account the major role that internal and external migration has in the demographic analysis, the population of the Bucharest-Ilfov region has a slightly upward trend.

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ECONOMIC ASPECTS REGARDING THE EXTRACTION OF WOOD USING HORSES: A CASE STUDY

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Abstract

This paper presents some aspects in the case of extracting wood with horses, insisting on its economic aspects. Three felling areas from production units P.U. V and P.U. VI, Marghita Forest District, Bihor Forest Administration were chosen. The areas included hygienic cuttings, thinning cuttings and progressive fellings, with small volumes of the average trees to allow extraction with horses. The logging costs were determined and then they were compared in different situations according to the share of extraction method by horses, respectively the traditional extraction by winches. The importance of determining unit rates to be grouped into group norms, centralized under the form of tables, with multiple inputs to estimate the logging costs as easily and accurately as possible was also highlighted. Thus, grouped norms have been drawn up for situations/variants of extraction by horses which render the unit costs in different situations. Three major factors that significantly influence the logging costs when using horses were identified, namely: the volume of the average tree, the degree of accessibility and the extraction distance by horses. The logging method has little influence, theoretically, but the cutting of large trees must be performed to facilitate the work by horses in the forest.

Key words**:** *costs, felling area, horse skidding, logging technology, unit rates, volume of the average tree*

INTRODUCTION

The logging costs are influenced by a number of factors [3], [10], but the chosen logging solution must be economically, environmentally and forestry optimal. Both the interests of the forester and the economic operator must be covered. In order to reduce the logging costs, the factors involved in the logging process must be analyzed and an optimal solution should be established, with minimal damage to the forest.

The extraction has a very large share in the logging process [4], (generally over 70% of expenses and physical work). Thus, choosing the extraction solution is an essential stage. Depending on the field conditions, the method of logging (wood system) is established and then the technology of logging is chosen. The logging technology is given by all the operations in their natural development order, necessary for the implementation of the adopted method and the optimal working solution [4], [9].

The means and methods of extraction are important factors that influence the logging costs. Thus, the following can be compared:

- ecological extraction variants with less ecological variants;
- variants with an extraction performed entirely by a certain machine (tractor, cable-way for logging), respectively with fragmented variants (e.g. by horse skidding);
- highly-mechanized variants (with a great need for new roads) with less mechanized variants, etc.

The working means must also be correlated with the minimum or maximum admitted slope gradient but also with the skidding and hauling distances, distinguishing thus between minimum, maximum admitted distances and optimum distances [8].

The degree of mechanization is given by the range of machines used, by the share of the mechanized activities at the expense of the operations executed manually or by horses.

Some authors consider the use of animals as an ecological solution for wood skidding [5],

[7], [12], but others believe that animals/horses should not be used in rough forest work in the 21st century (Romania has been criticized for using animals in the forest - horses and oxen).

The horse skidding is used in the felling areas located on a slope with a slope of less than 40%, in areas where extraction cannot be performed by winch up to the tractor road or the cable system. It is recommended for the extraction of short or multiple assortments, with small weights, for distances around 100-200m [6].

In this paper the logging costs obtained from the exploitation of three felling areas with and without horses are analyzed. A simulation is made regarding the costs in the case the share of the horse skidding operation increases at the expense of the winch skidding (pulled by winch mounted on the tractor).

The chosen felling areas are located within Marghita Forest District (Table 1), have an average slope, grade 3 of accessibility (average distance between 501 and 1,000 m), hill area, hardwood species and comprise three categories of works:

- Special cuts, hygiene cuttings;
- Care works, thinning cuttings;
- Regenerative, progressive fellings.

MATERIALS AND METHODS

With the help of a program made in Microsoft Excel, the logging costs were determined for the concrete situations in the field and a simulation was performed on how to extract the wood for three felling areas within production units P.U. V and P.U. VI, Marghita Forest District, Bihor Forest Administration [2] (Table 1):

- P1359134 E.V. (evaluation report) no. 143 Cuzepe in which special cuttings are foreseen-hygiene cuttings;
- P1359141 E.V. no. 125 Budoi, care works - thinnings;
- P1458512 E.V. no. 20701 Comp. Cuzap, regeneration - progressive cuts;

The inventory was made in 2018 and the felling areas were proposed for exploitation in 2018 and 2019.

Table 1. The situation of the three analyzed felling areas, characteristics

Characteristics of the felling areas	P1359134 143 Cuzepe	P1359141 125 Budoi	P1458512 20701 Comp.Cuzap
Production unit	P.U. V Cuzap	P.U. V Pădurea Neagră	P.U. V Comp.Cuzap
Compartment	83B, 84B, 87B, 88B	127B	120
Total volume, m^3	60	373	188
Number of trees, pieces	104	790	310
Volume of average tree, m^3/piece	0.58	0.47	0.61
Slope, degrees	20-23	20	15
Surface of felling area, ha	38.67	15.00	26.60
Type of cutting	Hygiene	Thinning	Progressive
Species	Go, Fa	Fa, Pl, Ca, Ci, Sc	Go
Degree of accessibility	G3	G3	G3
Usable seedlings, %	-	-	39.85
Exploitation period	20.08.2015-15.11.2018	16.10.2018-21.12.2018	22.01.2019-15.04.2019

Source: Management Plan P.U V, VI, Marghita Forest District [2].

In order to determine the logging costs, two situations as regards the working methodology were taken into consideration, as follows:

a. the initial data (general report, felling area sheet) is introduced in the programme Deviz_ exploatari.xls, sheet initial data, the costs are automatically determined and out of the centralized sheet, the unitary tariff results for the whole wood, with/without branches, and separately costs for branches in case they would be brought to the platform;

b. grouped norms determined for the given felling area are used.

In the first case, in order to facilitate the calculation method regarding the determination of the logging costs for a certain felling area, the programme Deviz_exploatare.xls was used for the automatic calculation of the volumes, time, fuels and lubricants necessary for operations and phases and the direct, indirect (including animal feed, their care expenses, etc.). The total expenses were determined starting from the introduction of some initial data characteristic to each felling area. The programme also includes the hourly rates for 2019. The specific time norms used in the wood works, specific fuel consumption, wage grids [1], [11] are used automatically.

In the second case, the grouped norms were determined, being centralized under the form

of tables containing unit rates, for certain working conditions and factors, in various situations encountered in practice. These rates can be used for any felling site, carefully following the main factors as entries in the grouped norms.

For thinning cuttings, the volume of the average tree was considered to be between 0.04-0.45m^3/tree, and for the regeneration cuttings, the volume of the average tree was considered > 0.45 m^3/tree.

RESULTS AND DISCUSSIONS

The direct costs, fuel and lubricant costs, indirect and total costs were determined for the three felling sites (Table 2).

Table 2. Centralization of the costs with the exploitation of the three felling areas in the concrete field conditions by winch skidding (15-50m) and forest tractor – hauling

Calculated indices		Expenses necessary for the exploitation of the felling areas …, in lei/m^3		
		P1359134	P1359141	P1458512
Total costs, without branches	lei	4,488.78	16,601.57	16,784.54
	lei/m^3	81.61	48.97	99.91
Total costs, with branches	lei	5,032.19	20,083.30	18,302.25
	lei/m^3	91.49	59.24	108.94

Source: Original data.

In order to show that the animal skidding is more expensive than the winch skidding of the harvested trees, a simulation was performed showing the influence of the two extraction means in the case of skidding operation upon the costs according to their share. The notations from figure 1 have the following meanings:

- T100 - the situation in which the extraction is made entirely by tractor;
- T80A20 - winch skidding is done on 80% of the felling area and animal skidding on 20% of the felling area;
- A100 - the skidding is performed entirely by animals.

The values were obtained for winch skidding on the distance category of 16-50m and for horse skidding on the maximum distance of 100m.

The total logging costs were also determined in case the skidding would be made entirely by horses, for two categories of skidding distances with animals (d <100m and 101 <d <200m) for the three studied felling areas (Figure 2).

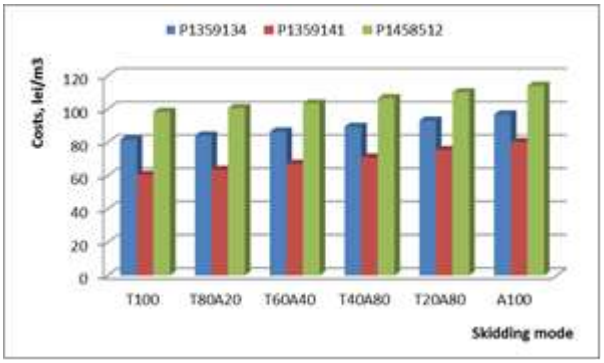

Fig. 1. Logging costs, for the three felling areas by winch skidding and/or animal skidding in different ratios

Source: Original data.

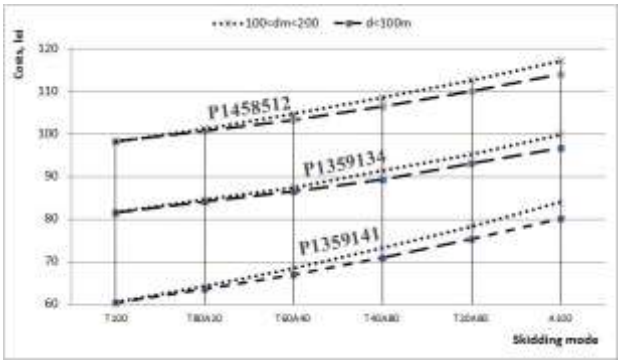

Fig. 2. Representation of the logging costs for the studied felling areas, by animal skidding on two categories of distance

Source: Original data.

For production sector, the determination of unit daily rates, under the form of tables with multiple inputs, in carrying out the care works (cleaning, thinning) and the regeneration cuttings on operations and phases, under different working conditions, it is important to know the costs of logging in a given case, to determine the economic efficiency in a simple and rapid way.

The logging factors that are involved are: the logging method, the means and method of skidding, density, distances, slope, intensity of the cutting, volume of the average tree, pruning, with/without gathering the branches and so on.

If the exploitation technology also includes the animal skidding, some grouped norms for

harnesses can be used, some of them being determined below, as an example:

A. Rates for animal skidding and hauling according to distances, average tree volume, species groups (Tables 3 and 4)

Table 3. Rates for animal skidding and hauling in case of softwood

Volume of average tree, m^3/tree	Rate for animal skidding including the preparation of the load on animals, on distances <… m, lei/m^3						
	100	200	300	400	500	700	1000
<0.14	14.11	16.17	18.36	20.55	22.61	26.85	33.15
0.141-0.45	11.65	13.43	15.21	16.99	18.77	22.33	28.77
>0.45	9.59	11.23	12.88	14.52	16.03	19.32	24.39

Source: Original data.

B. Unit rates of exploitation according to the density of the extracted trees, slope, degree of accessibility (Tables 5 and 6)

Table 4. Rates for animal skidding and hauling in case of hardwood

Volume of average tree, m^3/tree	Rate for animal skidding including the preparation of the load on animals, on distances <… m, lei/m^3						
	100	200	300	400	500	700	1000
<0.14	16.03	18.77	21.51	24.11	26.72	31.92	41.37
0.141-0.45	12.60	14.93	17.13	19.32	21.51	25.89	31.51
>0.45	11.10	13.15	15.21	17.26	19.18	23.29	29.87

Source: Original data.

Specifications: *skidding by animals on maximum distances up to 300m, and by winches on category <15m, marked trees 100-400pcs, hauling 100% by forest tractor, on accessibility degrees, cold season, pruning <0.3, long wood system, slope <20°*

Table 5. Softwood rates, without collecting branches, depending on the skidding distance by animals and the degree of accessibility, lei/m^3

The volume of the average tree, m^3/tree	Rates according to the skidding distance by animals... and the degree of accessibility, lei/m^3																			
	G1				G2				G3				G4				G5			
	<100	101-200	201-300	301-400	<100	101-200	201-300	301-400	<100	101-200	201-300	301-400	<100	101-200	201-300	301-400	<100	101-200	201-300	301-400
0.041-0.060	94.69	97.98	101.27	104.40	96.10	99.39	102.68	105.81	98.15	101.44	104.73	107.86	100.77	104.06	107.35	110.48	103.3	106.59	109.88	113.01
0.061-0.090	85.03	88.32	91.61	94.74	86.44	89.73	93.02	96.15	88.49	91.78	95.07	98.20	91.11	94.40	97.69	100.82	93.64	96.93	100.22	103.35
0.091-0.140	77.52	80.82	84.11	87.23	78.93	82.23	85.52	88.64	80.98	84.27	87.57	90.69	83.60	86.89	90.18	93.31	86.13	89.43	92.72	95.84
0.141-0.200	64.80	67.59	70.23	72.86	66.21	69.00	71.64	74.27	68.18	70.98	73.61	76.25	70.82	73.62	76.25	78.88	73.44	76.24	78.87	81.51
0.201-0.300	61.66	64.46	67.09	69.73	63.07	65.87	68.50	71.14	65.05	67.85	70.48	73.12	67.69	70.49	73.12	75.75	70.31	73.11	75.74	78.37
0.301-0.450	57.29	60.09	62.72	65.35	58.70	61.50	64.13	66.76	60.68	63.48	66.11	68.74	63.32	66.11	68.75	71.38	65.94	68.73	71.37	74.00
0.451-0.701	57.52	59.99	62.46	64.93	58.89	61.36	63.83	66.30	60.80	63.27	65.74	68.20	63.51	65.98	68.45	70.91	66.13	68.60	71.07	73.54
0.701-1.100	53.58	56.05	58.52	60.98	54.95	57.42	59.89	62.36	56.86	59.33	61.80	64.26	59.57	62.04	64.50	66.97	62.19	64.66	67.13	69.60
1.101-1.600	52.14	54.61	57.08	59.54	53.51	55.98	58.45	60.92	55.42	57.89	60.36	62.82	58.13	60.60	63.06	65.53	60.75	63.22	65.69	68.16
1.601-2.500	50.07	52.54	55.00	57.47	51.44	53.91	56.38	58.85	53.35	55.82	58.28	60.75	56.06	58.52	60.99	63.46	58.68	61.15	63.62	66.08
2.501-3.700	47.86	50.32	52.79	55.26	49.23	51.70	54.17	56.63	51.14	53.60	56.07	58.54	53.84	56.31	58.78	61.25	56.47	58.93	61.40	63.87

Source: Original data.

Table 6. Hardwood rates, without collecting branches, depending on the skidding distance by animals and the degree of accessibility, lei/m^3

The volume of the average tree, m^3/tree	Rates according to the skidding distance by animals... and the degree of accessibility, lei/m^3																			
	G1				G2				G3				G4				G5			
	<100	101-200	201-300	301-400	<100	101-200	201-300	301-400	<100	101-200	201-300	301-400	<100	101-200	201-300	301-400	<100	101-200	201-300	301-400
0.041-0.060	96.09	99.38	102.7	104.6	97.79	101.1	104.4	106.3	100.3	103.6	106.8	108.7	103.7	107.0	110.3	112.1	106.7	110.4	113.3	115.2
0.061-0.090	85.46	88.75	92.04	94.00	87.16	90.45	93.74	95.69	89.64	92.93	96.22	98.16	93.05	96.34	99.63	101.56	96.12	99.41	102.70	104.62
0.091-0.140	76.69	79.98	83.27	85.31	78.39	81.68	84.97	87.00	80.87	84.16	87.45	89.47	84.28	87.57	90.86	92.87	87.35	90.64	93.93	95.93
0.141-0.200	67.75	70.55	73.18	74.75	69.45	72.24	74.88	76.44	71.93	74.72	77.36	78.91	75.34	78.13	80.77	82.31	78.50	81.29	83.93	85.46
0.201-0.300	62.97	65.77	68.40	70.05	64.67	67.46	70.10	71.74	67.15	69.94	72.58	74.21	70.56	73.35	75.99	77.61	73.72	76.52	79.15	80.76
0.301-0.450	58.85	61.64	64.28	65.94	60.54	63.34	65.97	67.63	63.02	65.82	68.45	70.10	66.43	69.23	71.86	73.50	69.59	72.39	75.02	76.65
0.451-0.701	56.24	58.71	61.18	62.73	57.87	60.34	62.80	64.35	60.38	62.85	65.32	66.86	63.77	66.24	68.71	70.24	66.85	69.31	71.78	73.30
0.701-1.100	53.66	56.13	58.60	60.17	55.29	57.75	60.22	61.79	57.80	60.27	62.74	64.29	61.19	63.66	66.13	67.67	64.27	66.73	69.20	70.73
1.101-1.600	50.26	52.72	55.19	56.78	51.88	54.35	56.82	58.40	54.40	56.87	59.33	60.91	57.79	60.26	62.73	64.29	60.86	63.33	65.80	67.35
1.601-2.500	48.13	50.60	53.07	54.67	49.75	52.22	54.69	56.29	52.27	54.74	57.21	58.80	55.66	58.13	60.60	62.18	58.73	61.20	63.67	65.24
2.501-3.700	46.03	48.50	50.97	52.58	47.66	50.13	52.60	54.20	50.18	52.64	55.11	56.71	53.57	56.04	58.50	60.08	56.64	59.11	61.57	63.15

Source: Original data.

C. Rates for the logging method in SHORT WOOD SYSTEM

If the trees have large volumes, it is recommended to cut the trees in the felling areas in short or multiple pieces in order to skid them by animals. Thus, a rate table can be designed depending on the logging method.

In tables 7 and 8, the grouped norms were accomplished for the logging method in short wood system, G3, animal skidding <400m and winch hauling <15m, gradient <20º, pruning <0.3, with forest tractor hauling, on the volume categories, density 100-400 trees/ha.

Table 7. Rates for Softwoods, the logging method in Short Wood System

The volume of the average tree, m^3/tree	Rate, lei/m^3, for a maximum animal skidding distance of … m							
	Softwood				Hardwood			
	<100m	<200m	<300m	<400m	<100m	<200m	<300m	<400m
0.041-0.060	99.27	102.56	105.85	108.98	100.57	103.86	107.15	109.06
0.061-0.090	89.61	92.90	96.19	99.32	89.94	93.23	96.52	98.46
0.091-0.140	82.03	85.32	88.62	91.74	81.11	84.40	87.69	89.71
0.141-0.200	72.43	75.23	77.86	80.49	75.80	78.60	81.23	82.78
0.201-0.300	67.50	70.30	72.94	75.57	69.12	71.92	74.55	76.19
0.301-0.450	63.13	65.93	68.56	71.19	64.55	67.34	69.98	71.63
0.451-0.701	62.90	65.37	67.84	70.31	61.80	64.27	66.73	68.27
0.701-1.100	58.80	61.27	63.74	66.21	59.02	61.49	63.96	65.51
1.101-1.600	57.05	59.52	61.99	64.46	55.42	57.89	60.36	61.93
1.601-2.500	54.67	57.14	59.61	62.08	53.01	55.48	57.94	59.54
2.501-3.700	52.46	54.93	57.40	59.86	50.73	53.20	55.67	57.26

Source: Original data.

CONCLUSIONS

According to the results highlighted in Table 2 and Figure 1, the animal skidding involves higher costs than the winch hauling in all the three analyzed situations, namely special hygiene cuttings, care works - thinning, regeneration - progressive fellings.

Comparing the unit rates obtained by the simulation proposed as a case study, it is observed that the distance in the case of animal skidding has a significant influence, the total logging costs increasing by 8.4% for distances up to 100m and by 12.9% for distances up to 400m in hardwoods and by 9.8-14.1% in softwoods for distances of 100-400m.

Regarding the application of the different methods of exploitation (short wood system versus long wood system) very close results are obtained: for softwood, at short distances (<100m) in the case of animal skidding, the costs increase by 1.1% for thin trees and by 2.6% for thick trees that have to be sectioned in short wood system in the felling areas. In hardwoods, the increase in costs is insignificant if the logging method is changed: + 0.3% for thin harvested trees and + 1.1% for very thick trees. The same is in the case of deciduous trees, the increases being very small: 1.0-2.2% for thin trees and 0.3-1.0% for thick trees. In conclusion, the logging method influences the total logging costs insignificantly, but the trees with high volume and weight must be sectioned to facilitate the animal work. There are measures that can be applied to reduce the effort of the animals when extracting: rounding (chopping, rounding with the axe) the ends of the logs, cutting it into pieces as short as possible, cleaning the branches, moving on the snow to make the effort as little as possible, the setting up of some hauling trails of 1.5 m width and with a maximum slope of 40%, helping the load to proceed and so on.

There are factors that reduce the logging costs in general regardless the means of extraction. In the analyzed case it is observed that the

volume of the average tree and the degree of accessibility have a major influence on the total costs (almost doubling the total costs).

If three factors that influence the costs significantly (volume of the average tree, degree of accessibility, skidding distance) are taken into account, an amplitude of 65.15 lei/m^3 is found in softwoods between the minimum rate obtained for large volumes, short distances, very good accessibility in the felling area and the exploitation of very thin trees, very distant felling areas from the permanent transport routes, long distances for animal skidding (Table 6).

Thus, in the case of the felling areas that are hardly accessible, with thick trees, it is recommended the entire extraction to be performed by tractor, but for hygienic work and thinning or extraction of trees with smaller volumes, it can also be used the horse skidding in order to protect the standing trees. We must not forget the ecological benefits of animal skidding; this wood extraction method brings little harm to the environment, the soil, the standing trees and the seedling. Therefore, in any exploitation activity, the control bodies must watch over the logging method and if the admitted damages are exceeded to recover these "losses" in order not to encourage those who exploit the wood to use destructive exploitation technologies.

At the moment and in the last few years, it is noticed a return in production of the requirement regarding the most accurate determination of the logging costs, the need for materials and fuels and an improvement of the plans and the way of determining the collection distances as well as the capture of several phases and operations that can intervene in the logging process, from stump to forest deposits are needed. Although the economic agents cannot be forced to make such detailed estimates, there is a growing interest to make documentation and calculations that will ensure them the efficiency of the works performed or a guaranteed profit following the tendering of a felling site and finally the wood recovery under a certain form. These unit rates grouped together should make their work easier, help them make better decisions when tendering felling sites and increase the efficiency of their activity.

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PERFORMANCE OF MICRO BROILER BUSINESSES IN CALABAR METROPOLIS, CROSS RIVER STATE, NIGERIA

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Abstract

This study was embarked upon to evaluate the performance of micro broiler businesses in Calabar metropolis. The objectives of the study included; to describe the socioeconomic characteristics of broiler business owners, to analyse the effects of selected socio-economic characteristics of micro broiler business owners on the survival of micro broiler businesses in Calabar metropolis, and to analyze the marketing mix and managerial practices of business owners in Calabar metropolis. It made use of primary data obtained from a random sample of 112 micro broiler operators. The data were analyzed using descriptive statistics, and Ordinary Least Square Multiple regression approach. The result of analysis revealed that micro broiler business ownership is almost evenly distributed among males 47.32 percent and females 52.68 percent; and that more than half (56.25 percent) of the respondents are within the age brackets of 36-45 years. The study also revealed that respondents had one form of formal education or the other with tertiary education accounting for 75.89 percent. On the survival/competitive advantage of micro broiler firms in the study area, the result of Ordinary Least Square analysis showed that output of broiler, flock size, business experience, mortality and extension contact significantly contributed to a firm survival in broiler business. The study revealed that firms applied some management practices and marketing mix activities in operating their businesses. The managerial practices adopted and their mean weights included; planning (M = 3.80), organizing (M = 3.47), directing (M = 3.80), coordinating (M = 3.63) and controlling (M = 3.91). Also, the analysis showed that the marketing mix practices adopted and their mean values were; product (M = 3.23), price (M = 3.04), place (M = 3.77) and promotion (M = 2.26). The study shows that micro broiler operators showed positive attitude to all the management function and marketing mix practices. The study recommended that micro broiler operators should organize themselves into cooperative societies to enable them enjoy the benefits of economies of size and credit facilities from lending agencies. It was also recommended that relevant extension services should be made available to broiler operators to improve their skills and knowledge in broiler business operations. Policy action of government should be directed towards capacity utilization of operators. Also, subsidies should be provided for cost of feeds and day old chicks as well as instituting a flexible credit policy to reduce cost of production.

Key words**:** *performance, survival, micro broiler, marketing mix*

INTRODUCTION

Presently, there is an urgent need to diversify Nigeria's economy by engaging in non-oil related businesses. The broiler farming (business) offers a fertile ground for this initiative. Broiler business is the rearing of meat-type birds like chickens, turkey, geese, ducks, guinea fowls, quails, etc. with chickens constituting about 70 percent of the total production. According to Food and Agriculture Organization of the United Nations (FAO, 1999) [20, 42], broiler production is an important aspect of poultry business in which the birds are kept for the purpose of providing meat for the population; since broiler meat is in very high demand accounting for 30 percent of meat production worldwide.

Unfortunately, entrepreneurship in agriculture has not fared well as a result of many socioeconomic, political and environmental factors militating against its performance. According to Harper (1984) [22], the performance of small scale agribusiness enterprises in Nigeria has been greatly hampered by the physical, institutional and economic environment. A large chunk of the agro-based micro and small enterprises in Nigeria are still at a low level of development in terms of number of jobs, wealth and value creation (Babajide, 2011) [6]. This is largely

attributed to the fact that a number of the active population that constitute the potential entrepreneurs remains unserved by the formal financial institutions; as a result of several factors ranging from lack of collateral security, poor feasibility studies, poor management and supervision, coupled with the fact that agribusinesses are seasonal and proned to environmental and natural hazards which explains the high risk factor associated with agribusinesses (Saunders, Blake, Hayes & Shadbolt, 2007) [40]. Apparently, this has impinged negatively on the performance of micro broiler businesses in no small measure.

Effiong and Umoh (2010) [13] observed that t he poultry industry as a whole has performed dismally in recent times as a result of inefficiency in resource use. Also the business environment for poultry is volatile and hostile due to a plethora of challenges which includes; high cost of inputs especially feeds, poor management, diseases and pests, lack of adequate extension coverage, problem of marketing, lack of infrastructure, absence of functional regulatory institutions to ensure that farmers conform to laid down standards for product safety and quality and lack of credit facilities. The combined effect of these problems has not only led to low output, but has also militated against capacity building for existing firms as well as making things difficult for new entrants to cope.

To stem this tide, successive administrations in Nigeria have come up with various interventionist programmes to alleviate poverty through agribusiness development, skills acquisition and training as well as provision of capital for start-ups and existing businesses. Yet, more still has to be done in this regard in view of the high rate of poverty and unemployment that has continued to plague a large section of the Nigerian population. Encouraging broiler businesses has the potential to change the fortunes of this great nation by bringing sustained economic development and growth especially at a time that there is dire need for diversification of the economy.

According to FAO report (2003) [18], the demand and supply gap for animal protein intake is quite high and therefore recommends that the minimum intake of protein by an average person should be 65g per day; of which 36g (55 percent) should come from animal sources. Nigeria is presently unable to meet this minimum standard. The animal protein consumption is less than 8g per person per day which falls far short of the FAO minimum standard (Niang & Jubrin, 2001) [33]. This has led to severe hunger and malnutrition in the country. Broiler business has considerable potential to bridge this nutritional gap since high yielding and exotic breeds are available and easily adaptable to our environment and the technology of production is relatively simple with high returns on investment. Glancey (1998) [21], Jaunch and Glueck (1998) [24] are of the opinion that performance can be measured in both financial and non-financial terms. Financial through sales, profitability return on capital, turnover, efficiency, leverage, liquidity, growth and non-financial involving customer-satisfaction, quality of products, employment generation, social responsibility and market share.

Statement of the problem

Over the years, there has been great concern about the state of broiler business in Nigeria arising from the fact that successive governments have since independence fashioned out several poverty alleviation programmes in the country to encourage the growth of Micro Small and Medium Enterprises (MSMEs). Despite the efforts of government, broiler business is still at a very low level of growth and development in terms of job creation, engagement of available local resources, local technology utilization, improved standard of living as well as contributing to the Gross Domestic Product (GDP).

New broiler businesses are started everyday but few survives and grow to become significant contributors to the GDP. The International Finance Corporation in 2002 [23] reported that, in every ten newly established businesses in Nigeria, only two survive up to the fifth year. The Small and Medium Enterprises Agency of Nigeria

(SMEDAN) [41] in supporting this assertion reported that, only 15 percent of newly established businesses survive the first five years in Nigeria. According to Babajide (2011) [6, 7] new firms spring up every time, but few grow rapidly to become significant international competitors. For majority of the small businesses in Nigeria, long term growth is uncertain. This is even worst in agribusinesses especially broiler farming where environmental factors beyond human control causes a lot of hazards, risks and uncertainties. According to Saunders *et al.* (2007) [40], environmental factors tend to play a larger role in agribusinesses planning and operations than other types of businesses. The biological basis of production for many firms means that production tends to be influenced by a range of physical factors largely outside the control of the business (e.g. climate, pest, diseases and weather). As a result, production is largely influenced by the seasons, restricting when some activities can be undertaken and creating peaks and troughs in the work and cash flows.

Plausible as these views expressed on the decline of broiler businesses may be, it is not based on systematic and empirical studies. In fact, systematic and painstaking studies to examine these issues are limited. Several studies on broiler agribusinesses in Nigeria such as Olasunkanmi (2008) [36], Olasunkanmi, Abiodun and Isaac (2013) [37], Anwasia (2015) [4], Folorunso, Abia, Okoroji, Dawang and Binuyo (2016) [19], dwelled mainly on the profitability, production and economic efficiency and not the low level of growth and development and the high exit rate prevalent in the industry. Also, effective government policies have been put in place to reduce unemployment through stimulating the number of new businesses without worrying about how to sustain those businesses and minimize the number of exits. It is therefore necessary and imperative to investigate and understand the performance of micro broiler firms in Calabar metropolis. It is in furtherance of the above quest for knowledge that this study was designed.

Objectives of the study

The specific objectives included:

(i)to describe the socioeconomic characteristics of broiler business owners;

(ii)to analyse the effects of selected socio-economic characteristics of micro broiler business owners on the survival of micro broiler businesses in Calabar metropolis; and

(iii)to analyze marketing mix and managerial practices of business owners in Calabar metropolis.

MATERIALS AND METHODS

Description of the study area

The study was carried out in Calabar metropolis covering the two Local Government Areas (Calabar south and Calabar Municipality) in Cross River State, Nigeria. Calabar South has its headquarters at Anantigha and situates on an area of 264 km^2 (102.2 square miles) and has a population of about 191,630 persons as at 2006 census. Calabar municipality has its headquarters at Marian Road Extension and lies on an area of 142km^2 (55 square miles) and has a population of 179,392 persons as at 2006 census. It is a tourist destination of the State. The combined landmass of the two local government areas lies on latitude 04º34’27’’N and longitude 6º 58’32’’E and is bounded by Odukpani Local Government Area in the North, Calabar River to the West; the Great Kwa River to the East and the Wetlands of Cross River Estuary to the South.

Languages spoken are Efik, Qua and Ejagam. Crops grown include: waterleaf, fluted pumpkin, cassava, cocoyam, plantain. Fishing activities take place in view of the coastal nature. Rearing of chickens in homestead is common in Calabar metropolis both for subsistence and commercial purposes as a poverty alleviation strategy. Their major delicacies include: fufu or garri with afang soup, vegetable soup, abak soup and ekpang nkukwo.

Rainfall ranges between 2,942mm to 3,424 mm and is evenly distributed making it a coastal town. Mean temperature ranges between 21.7 ºC and 31.3 ºC and a high relative humidity (NAAR, 1995) [32].

Calabar's climate is classified as tropical, and has a short dry spell that has little effect. Precipitation is lowest in January with an average of 29mm with most of the precipitation being seen in July averaging 426 mm at an average temperature of 27.3 ^{o}C. March is the hottest month of the year and August the coldest with 21.7^{o}C (climate. data.org) [10]

Sampling procedure and sample size

The study population comprised of all micro broiler business owners in Calabar metropolis. A sampling frame for each Local Government Area consisting of a list of practicing broiler business owners were obtained from the Department of Livestock, State Ministry of Agriculture. Broiler businesses in the metropolis were then categorized into micro, small and medium enterprises. All micro enterprises were identified to form the population of the study. The Taro Yamane formula (1960) was applied to each of the list to draw samples.

The formula was stated as follows:

$$n = \frac{N}{1 + N(e)^2}$$

where:

n	=	sample size
N	=	population size
1	=	unity of constant
e	=	tolerable error

The samples drawn from each of the Local Government Area (Calabar municipality – 76 and Calabar south – 36) were then merged to obtain a total and final sample size of 112 micro broiler business owners. The essence of using the formula is to ensure that, samples drawn from each Local Government Area was proportionate to the population size for each Local Government Area and to avoid lopsidedness. Simple random technique was then used to select firm owners. However, since some of the practicing broiler firms were not registered at the time and most of the registered firms were out of business and could not be located, veterinary operators and feed sellers (shops/outlets) were used to reach some of the unregistered operators. These unregistered ones were used to make up the sample size of 112 micro broiler operators.

Method of data collection

Data were generated from primary sources. Primary data were collected through field survey from operators of broiler businesses in the study area using questionnaire, interviews and observations. Information were also collected from records of broiler operators such as invoices, sales day books, etc.

Research instruments

Since the study involved a survey design, the main instruments used in gathering data were structured questionnaire and interviews. The questionnaire was developed to adopt the closed-ended/structured statements. The questionnaire were self-administered and retrieved. Oral interviews were conducted to enable the researcher obtain some clarity on certain issues that questionnaire could not adequately address. The interviews were self-administered.

Validity of instruments

Validity refers to the extent to which an empirical measure adequately reflects the real meaning of the concepts or constructs under consideration (Etuk, 2010) [17]. Validity in its simplest form indicates whether or not the measuring instrument will test what it is meant or designed to test. The instruments were subjected to thorough scrutiny in relation to its ability to achieve the research objectives as stated, level of coverage, comprehensibility, logicality and suitability for prospective respondents by other experts to ensure that errors of ambiguity and incorrect wording or instructions were eliminated and that the questions or statements follow the right sequence. The instrument was modified where necessary. This ensured validity and accuracy of the instrument.

Data analysis technique

The questionnaire were checked for completion and then coded. Qualitative analysis consisted of examining, categorizing, tabulating and recombining evidences to address research questions. The data were grouped into meaningful patterns and themes according to observations to help in

summarizing and organization of data. Descriptive statistical techniques such as frequency counts, percentages, arithmetic mean were used for analysis. Inferential statistics used was multiple regression analysis.

(i)Objective I was analyzed using frequency tables and percentages to describe the socioeconomic characteristics of broiler farmers.

(ii)Objective II was analyzed using multiple regression model to examine the variables that enhance or influence business survival.

(iii)Objective III was analyzed using descriptive statistics (frequency count and means) to measure the managerial and marketing mix practices adopted by broiler operators.

Model specification

The multiple regression model

The multiple regression model was adopted from Dziwornu (2014) [12]:

$$S_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \beta_6 x_{6i} + \beta_7 x_{7i} + \beta_8 x_{8i} + ei$$

where:

S_i =firm survival or competitive advantage measured as average variable cost per broiler bird produced per farmer

x_1= output (number of birds at maturity)

x_2 = flock size (number of birds stocked)

x_3 = age of firm owner (years)

x_4 = experience in years

x_5 =educational level in years (years of schooling)

x_6 = training/seminar (in poultry) (Dummy 1 = received training, 0 = no training)

x_7 = mortality (number of death birds)

x_8 = extension contact per cycle (number of contacts)

β_0 = Y intercept

$\beta_1 - \beta_8$ = the parameters estimated and measures slope coefficient of the dependent variables (survival/competitive advantage)

e = error term

The main variable inputs required in broiler production include feed, day-old chicks, labour, vaccines, medication, water, energy among others. These inputs are important in the production of broiler and their cost has the tendency to affect the total cost of production. The higher the cost of these variable inputs, the higher the cost of broiler production will be and hence reducing competitive advantage and thereby threatening the survival of the business. If variable cost continues to increase, it gets to a point where sales cannot cover variable cost of production and the firm losses competitive advantage and thereby closes down. The average variable cost of production per bird in this study is taken to mean survival of the broiler firm.

$$\text{Average variable cost (AVC)} = \frac{\text{TVC}}{\text{Q}}$$

where:

TVC = Total variable cost
AVC = Average variable cost
Q = Output
TC = Total cost
TFC = Total fixed cost
TVC = Total variable cost

Total variable cost (TVC) consisted of all the operating cost incurred by the firm, from stocking to point of sale (market size) times the number of production cycles in a year.

Total revenue (TR) consist of receipts from total sales (Gross revenue = Quantity produced x price per bird ₦).

Fixed costs: Are cost which do not vary with output. Fixed cost in this study includes rent on land, cost of housing, drinkers, feeders, lantern, stoves, generators and shovel/spades. The values of the fixed cost items were subjected to depreciation except rent on buildings.

Depreciation is the allowance in monetary terms for the value of fixed cost being used up in production activities. The straight line depreciation was used because the method is best suited for assets with short and predictable useful life (Certified Practicing Accountant of Australia, 2012) [9].

$$\text{Depreciation} = \frac{\text{Cost} - \text{Salvage value}}{\text{Useful life}}$$

Depreciation is the annual depreciation. Cost is the purchase cost of the item. Salvage value

is the value of items after their useful life. In this study, since the fixed cost items are not resold after use, their salvage values are assumed to be zero. Useful life refers to the length of time that a fixed cost item is used until it is no longer useful for its purposes.

Variable cost (VC) refers to cost that varies according to output level. They are directly proportional to output volume and increases as output increases and decreases as output decreases. In this study, variable cost includes; cost of day old chicks, feeds, medication/vaccines, labour, transportation, energy, water, sawdust/wood shaving, etc. Revenue in this study refers to all cash receipts from the sale of broilers and litter.

Managerial practices

Five functions of management were identified, viz., planning, organizing, directing, coordinating and controlling and were analyzed. Each of these business management skills comprised of a number of items/questions measuring the specific skills. In order to measure the respondents perspective to skill ability rate in all items/questions under each of the business management skill, five-point Likert scale was used. The Likert scale shows the level of business management skills which were ranked from 1 to 5 (1 = never, 2 = rarely, 3 = sometimes, 4 = often and 5 = always). The mean of each statement was then used to rank their perception and level of adoption of the management practice as presented. Weighted mean that was used for comparison was (3.00). All means that were above 3.0 were considered high. All means that were lower than 3.0 were considered low.

RESULTS AND DISCUSSIONS

The socio-economic characteristics of micro broiler businesses in the study were analyzed based on gender (sex), age, marital status, household size, educational level, major occupation, source of fund for initial investment, years in business, working experience before business setup, training, extension contact and frequency of extension visits, access to credit, group membership, ownership structure (type of business organization), flock size, labour source and employee size of micro broiler business. In terms of respondents' gender, table 1 shows that, the ownership of micro broiler businesses in Calabar metropolis was almost evenly distributed among males 47.23 percent and females 52.68 percent. The strong gender sensitivity here is in line with the current drive to alleviate poverty and eradicate hunger among families through agriculture (SDG 1, 2, & 5). This also conforms to MSME (2013) [31] report which says that micro enterprises are more gender equal in both business owners and employees. According to Kehinde, Nduka, Uchendu and Kehinde (2016) [26], this is contrary to the a priori expectation that more men are involved in broiler business because of the capital and labour intensive nature.

It can be inferred also from Table 1 that, majority (56.25 percent) of the broiler operators fall within the age brackets of 36-45 years followed by 26-35 years with 33.04 percent. The result suggests that, the active population is using entrepreneurship in broiler production to stem the tide of unemployment that is rife in the country. The remaining chunk of 8.93 percent for people above 46 years of age may be those that are either retired or are planning for retirement. The result shows that, the economically active groups of respondent were predominantly involved in micro broiler businesses in the study area. On educational attainment, the study revealed that all respondents had one form of formal education with tertiary education accounting for 75.89 percent. The implication is that the respondents are highly literate and should be able to read labels and literature of feed and drugs, interpreting and using cost effective production techniques.

The educational level attained by the entrepreneur not only increases his productivity, but also enhances his/her ability to read, understand and evaluate new production technologies (Obasi, 1991) [34]. Also, it is observed from Table 1 that, majority (73.21 percent) of the respondents were married, 24.11 percent were single and

2.68 percent were separated. Access to pooled funds from married couple may be the reason why majority of the startup capital were from personal savings. Household sizes of 1-5, accounted for 75 percent, while household sizes of 6-10 accounted for 25 percent.
This suggest that, though family labour was rife dependency ratio was not high as well as drawing from business to attend to family needs.

Table 1. Gender, age, educational level, marital status and household size of respondents

	Frequency	Percentage
Gender		
Male	53	47.32
Female	59	52.68
Total	112	100.00
Age (years)		
18-25	2	1.79
26-35	37	33.04
36-45	63	56.25
46 and above	10	8.93
Total	112	100.00
Mean=35		
Educational level		
Primary (6)	4	3.57
Secondary (12)	23	20.54
Tertiary (16)	85	75.89
Total	112	100.00
Mean= 11.33		
Marital status		
Single	27	24.11
Married	82	73.21
Separated	3	2.68
Widowed	0	0
Total	112	100.00
Household size		
1-5	84	75
6-10	28	24.99
11-15	-	-
Above 15	-	-
Total	112	100.00
Mean= 5.5		

Source: Field survey, 2017.

Table 2 reveals that 86.61 percent of the respondents financed their businesses from personal savings while a negligible percentage relied on relatives (3.57 percent), cooperatives (2.68 percent) and banks (7.14 percent). This result implies that accessibility of credit is still difficult for micro broiler business operators or may be huge capital is not required because of the scale of production.

Also, respondents were asked of the major occupation they are engaged in. 48.21 percent of respondents were paid employment holders, 47.32 percent were into farming while 3.57 percent were artisans. The implication is that broiler business can conveniently be combined with other forms of employment like paid employment, trade and artisanry.

Table 2. Source of finance and major occupation

	Frequency	Percentage
Source of finance		
Personal savings	97	86.61
Relatives	4	3.57
Cooperative	3	2.68
Banks	8	7.14
Total	112	100.00
Major occupation		
Farming	53	47.32
Paid employment	54	48.21
Artisan	4	3.57
Others	1	0.89
Total	112	100.00

Source: Field survey, 2017.

Furthermore, Table 3 reveals that there are two main types of broiler business ownership that exist in the study area, viz, sole proprietorship (family based), accounting for 93.75 percent of the respondents and partnership accounting for 6.25 percent.

Table 3. Ownership structure, number of years in business, number of years in poultry business, number of years of working in poultry farm before setting up your own business

	Frequency	Percentage
Ownership structure		
Sole proprietorship	105	93.75
Partnership	7	6.25
Cooperative	0	0
Total	112	100.00
Years of setting up poultry business		
1-5	95	84.82
6-10	13	11.61
11-15	3	2.67
16-20	1	.89
Total	112	100.00
Mean = 10.5		
Working experience before business startup		
1-3	11	9.82
4-6	2	1.78
7-9	2	1.79
10 and above	-	-
Total	15	13.39
Mean = 5.0		

Source: Field survey, 2017.

It is apparent from the result that sole proprietorship is the main type of business ownership in Calabar metropolis and implies that entrepreneurs are involved as key decision makers in business operations.

Also, Table 3 shows that 84.82 percent of the respondents had been in business for between1 and 5 years, while a negligible 15.17 percent of the respondents had been in business for between 6 and 16 years. This may be an indication of high rate of exits from 6 years or it could be that businesses don't survive beyond 6 years. This corroborates SMEDAN (2007) [41] report that, only 15 percent of newly established businesses survive the first five years in Nigeria. More so, the table shows that only 13.39 percent of the respondents had various years of working experience in broiler businesses before business startup ranging from 1-8. This may be the reason for the inexperience displayed by some of the broiler business operators in handling operational activities. It also indicates that majority of the entrepreneurs were new entrants and embarked on micro businesses since they lacked experience and capital to handle larger businesses. This agrees with Mgbakor and Nzeadachie (2013) [30].

Table 4. Flock size, labour involved in operations

	Frequency	Percentage
Flock size		
<500	88	78.57
500-1000	24	21.43
1001-1500	0	0
Above 1500	0	0
Total	112	100.00
Mean = 525		
Labour involved		
Family	85	75.89
Hired	15	13.39
Both	12	10.71
Total	112	100.00

Source: Field survey, 2017.

Findings on Table 4 reveals that 78.57 percent of the respondents had flock size of less than 500 birds while a paltry 21.43 percent had flock size of between 500 and 1,000 birds. The predominant small flock size may be attributable to high cost of inputs required and inadequate capital faced by entrepreneurs as well as inexperience. Also, family labour accounted for 75.89 percent, hired labour 13.39 percent and both family and hired labour used together accounted for 10.71 percent. The result shows that micro-broiler business in the study area is mostly homestead and depends mostly on family labour to cut cost.

Table 5 shows that only 27.68 percent of the respondents had access to extension contacts while 72.32 percent had no extension contacts within the production cycle. This means that the broiler operators in the study area lacked certain knowledge of innovations and practices that are supposed to aid operations and hence enhance performance.

Table 5. Extension contact and number of visits, membership of cooperative, training/seminar, type of training and credit received

	Frequency	Percentage
Extension contact		
Yes	31	27.68
No	81	72.32
Total	112	100.00
Frequency of extension visit within a production cycle		
No contact	81	72.32
Once	13	11.61
Twice	15	13.39
Thrice	3	2.68
Total	112	100.00
Membership of cooperative		
Yes	27	24.11
No	85	75.89
Total	112	100.00
Training received		
Yes	109	97.32
No	3	2.68
Total	112	100.00
Credit received		
Yes	20	17.86
No	92	82.14
Total	112	100.00

Source: Field survey, 2017.

Of the 27.68 percent that had access to extension 2.68 percent had 3 visits, 13.39 percent had 2 visits and 11.61 percent had only 1 visit within the production cycle. The table also reveals that only 24.11 percent of the respondents were members of cooperative. This may be a contributing factor to their inability to access credit from lending agencies as concession is given mostly to cooperative groups. 17.86 percent had access

to credit while 82.14 percent had no access to credit from the table. From the table, 97.32 percent of respondents received training/seminar on poultry production while 2.68 percent had no training. According to Cooper and Gascon (1992) [11], training and experience are often considered to be directly related to business performance, apart from formal education.

It was found that most respondents in the study area had either managerial, technical or both trainings to equip them for operations.

Table 6. Status of employment according to gender

	Frequency	Percentage
Male workers		
Casual	40	25.48
Permanent	69	43.95
Sub total	109	69.43
Female workers		
Casual	10	6.37
Permanent	38	24.20
Sub total	48	30.57
Total	**157**	**100.00**
Summary		
Male workers	109	69.43
Female workers	48	30.57
Total	157	100.00
Mean	1.40	

Source: Field survey, 2017.

The findings on Table 6 shows labour information and statistics disaggregated into gender. It can be seen that a total of 157 workers were employed in micro broiler firms in the study area. 109 were males accounting for 69.43 percent and 48 were females accounting for 30.57 percent. Male workers were further disaggregated into casual (25.48 percent) and permanent (43.95 percent). Also, female employees were disaggregated into casual (6.37 percent) and permanent (24.20 percent). It can be inferred from the result that fewer females were employed because of the labour intensive nature of micro broiler business. Also, majority of the workforce were on permanent basis (68.15 percent) while 31.85 percent were casual. The high percentage of permanent labour involved here is obviously a contributing factor to the high production cost witnessed in the study. 157 persons were engaged in the activities of the businesses and could earn an income. The overall essence of entrepreneurship in agriculture is job creation, reduction of hunger and poverty and improving standard of living and conforms with (SDG 1 & 2). The mean number of workers employed is approximately 1. This conforms to MSME (2013) report on the classification of number of employees in a micro enterprise being less than 10.

Survival of micro broiler businesses

Business survival is the ability of an enterprise to continuously remain in operation no matter the challenges of the environment and to meet the objectives of the business (Akindele,Ogimi & Omoyele.,(2012) [3].

According to Adeoye (2012) [2], environmental changes are continuously exerting new pressures on enterprises performance and survival is in terms of being able to cope with the changes by developing and implementing strategies to reorganize and reform the way products are produced and distributed to final consumers.

The business survival/competitive advantage was assessed using average variable cost (AVC) as proxy for survival of the firms. Of the four functional forms of multiple regression estimated, the linear model provided the best fit in terms of highest number of significant variables and largest R^2 value.

Table 7 shows that eight regressors accounted for 41 percent of the total variation in the average variable cost per bird of micro broiler businesses in Calabar metropolis. Five variables out of eight regressors were found to have significantly contributed to the variation in average variable cost (AVC), viz., output, flock size, business experience, mortality and extension contact per cycle.

Output of broiler was negative and significant at 10 percent level. This inverse relationship shows that as larger quantities of variable inputs are applied to fixed plant and equipment, average variable cost decline with the increase in output of broiler (Jhingan, 2009) [25].

Also, the units of output that a firm produces do not cost the same amount to the firm but they are sold at the same price.

Table 7. Factors that affect the survival of micro broiler businesses in Calabar metropolis

Variables	Linear (+)	Exponential	Semi-Log	Double Log
Output of broiler(X1)	-2.3799*	-0.0017	-271.1108	-0.1888
	(1.3468)	(0.0011)	(188.458)	(0.1608)
Flock size(X2)	2.0318*	0.0014	85.658	-0.0471
	(1.3582)	(0.0011)	(206.462)	(0.1762)
Age of firm owner (X3)	-0.4348	-0.0013	-6.6835	-0.0051
	(12.1027)	(0.0101)	(25.4461)	(0.0217)
Experience(X4)	-16.1896***	-0.0151***	-55.5935**	-0.0537**
	(5.7224)	(0.0018)	(25.0257)	(0.0217)
Educational level(X5)	4.6590	0.0034	49.1423	0.0334
	(6.1824)	(0.0052)	(68.7304)	(0.0587)
Training/Seminar(X6)	132.24	0.0932	-5.4887	0.0375
	(82.1619)	(0.0687)	(26.635)	(0.0694)
Mortality(X7)	-3.9366**	-0.0031**	24.173	-0.0090
	(1.7658)	(0.0014)	(17.3539)	(0.0227)
Extension contact per cycle (X8)	20.9950***	0.0171	58.3358	0.0194
	(17.7008)	(0.0148)	(81.3293)	(0.0148)
Constant	1225.96***	7.1320***	2159.16**	7.8603***
	(125.797)	(0.1052)	(260.39)	(0.2222)
Diagnostics				
R^2	0.4097	0.3999	0.4463	0.4142
Adj R^2	0.3638	0.3534	0.4033	0.3686
F-stat	8.9340***	8.5832***	10.3791***	9.1014***

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Source: Field survey, 2017.

Therefore, the per unit cost or average variable cost need to be determined in order to gain competitive advantage. The critical value of output is when the AVC is minimum but it begins to rise when diminishing returns sets in, and eventually it gets to a point when micro broiler businesses are thrown out of business as a result of loss of competitive advantage. Flock size is positive and significant at 10 percent level. The larger the flock size, the more cost advantage the business enjoys from economies of scale. In respect of cost and return, the total variable cost (TVC) and average variable cost (AVC) per bird were highest in smaller flocks than in larger flocks. This agrees with the work of El-Tahaway, Taha and Adel (2017) [14]. Large flock size gives higher output of broiler and consequently high sales as well as increased survival/competitive advantage. Majority of the broiler operators sampled in this study had small flock size which meant higher TVC and AVC and these had negative impact on survival of firm/competitive advantage.

Years of managing poultry business was equally negative and significant at 1 percent. The longer the years of broiler production, the more exposed the farmer becomes to broiler production techniques that minimize cost (Dziwornu, 2014) [12], and leads to low AVC; hence, high competitive advantage. Longer years of managing poultry business means experience which can be used to achieve survival/competitive advantage. Survival/competitive advantage is created when a firm uses its resources and capabilities to achieve a lower cost structure through good and efficient management practices. Factors that reduce per unit cost of production promote competitive advantage of micro broiler businesses (Porter, 1985) [38]. Continued survival and profitability of any agribusiness is guaranteed by competitive advantage (Sanchez & Perez, 2005) [39].

Mortality was negative and significant at 5 percent signaling an inverse relationship with AVC. High mortality implies increase in cost, reduction in batch size and sales and therefore affects the survival/competitive advantage of the micro broiler firm and vice versa. If the situation is not managed appropriately and promptly may lead to the distress of the business. This conforms with Lungu (2013) [29] who states that high bird mortality reduces the batch size and hence grossly affect the sales revenue. Extension contact

was positive and significant at 1 percent. The linear relationship here implies that firm owners that had access to extension contact were privy to better information that enabled them to adopt improved technologies/practices. This result conforms to Kehinde *et al.* (2016) [26] which states that improvement in extension contact to farmers would lead to better access to information which invariably would lead to better improved practices and more income.

Factors affecting performance of micro broiler businesses

Four functional forms with OLS regression were specified to analyze factors that affect performance. Performance of the firms was assessed using net farm income. The linear model gave the best fit with an R^2 of 95 percent and four significant variables.

Table 8. Factors that affect the performance of broiler businesses in Calabar metropolis

Variables	Linear (+)	Exponential	Semi-Log	Double Log
Marital status (X1)	-8,358 (16,165)	0.0368 (0.0871)	-10252.2 (20343)	0.0025 (0.0653)
Age of firm owner (X2)	-54.62 (819.6)	0.0006 (0.0057)	37694.7 (47873.9)	-0.1448 (0.1548)
Gender (X3)	-15,355 (12,268)	-0.0688 (0.0829)	1921 (18135)	-0.0544 (0.0591)
Educational level (X4)	2,325 (2,290)	0.0059 (0.0194)	6384.55 (50181.7)	-0.0874 (0.1620)
Household size (X5)	4,585 (5,427)	-0.0047 (0.0328)	10455.5 (25757.7)	0.0057 (0.0827)
Business experience (X6)	9092.03*** (1956.54)	0.0385** (0.0177)	34608.4* (17894.9)	0.1450** (0.0581)
Extension contacts received (X7)	12,638 (14,943)	-0.0591 (0.0650)	-6635.42 (13713.2)	-0.0493 (0.0454)
Training received (X8)	-6,343 (41,071)	-0.7294*** (0.2530)	83295.1 (56254.6)	-0.2440 (0.1822)
Member of cooperative(X9)	12,516 (28,778)	-0.1937 (0.1598)	-3418.32 (35622.1)	-0.0754 (0.1150)
Credit received(X10)	48,920** (21,850)	-0.0177 (0.1708)	16777.5 (36665.5)	0.0153 (0.1183)
Flock size(X11)	1,965*** (249.5)	-0.0045*** (0.0014)	-251087*** (86381.4)	-1.9180*** (0.2785)
Man hours per day(X12)	-9,432 (5,903)	-0.0001 (0.0266)	55583.7** (25245)	0.0326 (0.0836)
Total variable cost(X13)	-1.026*** (0.221)	3.95e-06*** (6.964e-07)	547640*** (84679.1)	3.2731*** (0.2731)
Constant	-8,358 (16,165)	12.0449*** (0.5386)	-5.9e+06 (652210)	-19.3566*** (2.1142)
Diagnostics				
R^2	0.9477	0.7607	0.7941	0.8811
Adj R^2	0.9408	0.7283	0.7667	0.8650
F-stat	136.5878***	23.4799***	29.0668***	54.7175***

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Field survey, 2017.

Table 8 shows that thirteen explanatory variables accounted for 95 percent of the variability in the net income of micro broiler businesses in Calabar metropolis. Out of thirteen explanatory variables regressed; four were significant to the variation in net income. They include business experience (P<0.01), credit access (P<0.05), flock size (P<0.01) and total variable cost (P<0.01). F-value of 136.59 was significant at 1 percent, indicating an overall good fit of the model.

Years of managing poultry business (business experience) showed a positive relationship with net income and were significant at 1 percent. This indicates that the more the

number of years an operator puts in broiler production, the more experienced he/she becomes and the higher the net income achieved depending on the prevailing circumstances. This result is consistent with Emaikwu, Chikwendu and Sani, (2011) [15], Ojo (2003) [35] and Adebayo and Adeola (2005) [1]. Access to credit had a positive and significant effect on the net income at 5 percent level. The entrepreneurs that had access to credits or financial grants were able to increase their profits. This increase in profit may be attributable to the ability to buy and use efficient and innovative inputs that controlled and reduced wastages and production cost. This finding is in line with Ashaolu, Momoh, Phillip and Tijani (2011) [5] which revealed that, access to credit resulted in higher productivity and profitability of farms in Nigeria.

Flock size was positively significant at 1 percent level. This means that large flock size yielded high broiler output and likely to make high sales. Operators with large flock size also enjoyed economies of scale as reflected in lower TVC and AVC (total cost per bird). This had a positive effect on net income since total cost per bird is lower and the birds are sold for the same price. This is in line with Olasunkanmi (2008) [36] which revealed that, commercial poultry production in Nigeria earns higher profit from larger flocks. It also agrees with Etuah, Nurah and Yankyera (2013) [16].

Total variable cost (TVC) was negative and significant at 1 percent level. This implies that, as the micro broiler businesses incur high cost, the net income becomes lower and vice versa. For this study, the components of TVC included day old chicks, feeds, medication/vaccines, energy, labour, transportation, water and sawdust/wood shaving. These inputs are relevant in the production of broiler and their cost tends to affect the overall cost of production. The higher the cost of these variable inputs, the higher the overall production cost will be, thereby affecting the net income of the micro broiler business. This is in consonance with the work of Dziwornu (2014) [12] and Etuah, Nurah and Yankyera (2013) [16]. The ability of any entrepreneur to control production cost is key to the success of any business. Hence, the rising cost of broiler production with its implication on performance calls for great concern. Controlling the cost of variable inputs (day old chicks, feeds) will lead to significant reduction in the per unit variable cost of broiler, hence increasing the net income of broiler businesses.

Managerial and marketing mix practices of micro broiler business operators

Managerial practices adopted by micro broiler business operators

Planning functions help broiler business owners in selecting objectives/goals and determining ways and methods of attaining those goals. All the six statements were adopted with budget and implementation ranking top (4.73) followed by developing means of evaluating progress and adjustments ranking second. This result has implication on the business production and marketing as operators are able to identify the production and marketing targets. Table 9 also indicates that the average level of planning skill among broiler operators (3.8) is high. This result contradicts the findings of Baliyan and Marumo (2016) [8] which stated that average level of planning skills for broiler farmers was low to moderate (2.10). The organizing functions help micro broiler operators in making decisions on the best way to coordinate tasks, people and the workplace. Five statements were used to measure organizing functions in micro broiler operators in the study area.

From Table 9, establishing relationship among workers "ranked first (3.74), followed by determining jobs to be done by staff" (3.60). The mean organizing skill was (3.47). This shows that micro broiler operators are able to provide structural framework, number of tasks and duties, as well as establishment of an environment suitable for team work. Directing functions has to do with the leadership, supervision, communication, motivation and personnel development. Five statements were used to measure directing skills. Table 9 also shows that "routine

supervision to ensure that jobs are done properly" was top most (M = 4.28), followed by "delegating necessary authority" (M = 3.77). Average level of directing skills was 3.80. This implies that micro broiler operators in the study area work through people to actualize the goals and objectives of the firms.

Table 9. Managerial practices of business owners in Calabar metropolis

S/N	Managerial practices	N(1)	R(2)	S(3)	O(4)	A(5)	Sum	Mean	Rank
A	**Planning**								
	Situation Analysis to know opportunities/obstacles	3(3)	19(38)	29(87)	56(224)	5(25)	377	3.37	6th
	Forecasting future development	1(1)	23(46)	28(84)	53(212)	7(35)	378	3.38	5th
	Set Specific, Realistic and achievable goals	2(2)	9(18)	26(78)	56(224)	19(95)	417	3.72	3rd
	Establish alternative action to be used in achieving goals	-	11(22)	28(84)	56(224)	17(85)	415	3.71	4th
	Developing Means of evaluating progress and adjustments	-	5(10)	26(78)	57(228)	24(120)	436	3.89	2nd
	Budget and implementation	3(3)	2(4)	6(18)	29(145)	72(360)	530	4.73	1st
	Grand mean							**3.80**	
B	**Organizing**								
	Set up structures for various activities	4(4)	16(32)	28(84)	55(220)	9(45)	385	3.44	4th
	Determining jobs to be done by staff	6(6)	11(22)	17(51)	66(264)	12(60)	403	3.60	2nd
	Selecting allocating and training of workers	7(7)	27(54)	39(117)	32(128)	7(35)	341	3.05	5th
	Defining lines of activities	6(6)	14(28)	29(87)	44(176)	19(95)	392	3.50	3rd
	Establishing relationships amongst workers in biz setting	3(3)	10(20)	18(54)	63(252)	18(90)	419	3.74	1st
	Grand mean							**3.47**	
C	**Directing**								
	Assign Duties and responsibilities	4(4)	12(24)	21(63)	64(256)	11(55)	402	3.59	5th
	Establish Results to be achieved	4(4)	7(14)	17(51)	76(304)	8(40)	413	3.69	3rd
	Delegating Necessary Authority	5(5)	10(20)	30(90)	48(192)	19(95)	422	3.77	2nd
	Creating desire for success through motivation	5(5)	8(16)	28(84)	48(192)	23(115)	412	3.68	4th
	Routine supervision to ensure jobs done properly	3(3)	3(6)	6(18)	48(192)	52(260)	479	4.28	1st
	Grand mean							**3.80**	
D	**Coordinating**								
	Providing for growth and development of workers	6(6)	10(20)	29(87)	54(216)	13(65)	394	3.52	3rd
	Keeping in touch with workers and keeping a sense of perspective	4(4)	8(16)	23(69)	67(268)	10(50)	407	3.63	2nd
	Providing for free flow of information	4(4)	6(12)	22(66)	63(252)	17(85)	419	3.74	1st
	Grand mean							**3.63**	
E	**Controlling**								
	Checking that plans are on target	1(1)	7(14)	11(33)	80(320)	13(65)	433	3.87	4th
	Checking that plans are on schedule		7(14)	12(36)	80(320)	13(65)	435	3.88	3rd
	Establishing predetermined goals/standards of performance in terms of cost	2(2)	6(12)	21(63)	53(212)	30(150)	439	3.92	2nd
	Measuring Performance against Predetermined goals standards through information gathering system	2(2)	13(26)	16(48)	48(192)	33(165)	433	3.87	4th
	Taking actions to correct deviation from goals and standards	2(2)	8(16)	14(42)	49(196)	39(195)	451	4.03	1st
	Grand mean							**3.91**	

Source: Field survey, 2017.

This is contrary to Lucas (1978) [28] who stated that owners of small businesses hardly delegate most of their day-to-day responsibilities and control functions to an enlarged and specialized team.

Coordinating involves synchronizing and unifying the actions of a group of people (workers). Coordination is a process of achieving orderly group effort and unity of action in pursuit of a common goal/purpose. Three statements were used to measure coordinating skills.

Providing for free flow of information (3.74) was topmost followed by "keeping in touch with workers" (3.63). On the average (M = 3.63), micro broiler owners were able to harmonize the parts and individuals of the enterprise and ensure that efforts were directed toward the set objectives of the enterprise. Controlling functions involve making decisions that concentrates on how well things are getting done according to plan and the achievement of predetermined goals. Five statements were used to measure controlling skills. "Taking actions to correct deviation from goals and standards" (4.03) ranked first followed by "Establishing predetermined goals/standards of performance in terms of cost" (3.92). Mean controlling skills was (3.91). This means that respondents were able to make activities/events conform to plan and targets.

Marketing mix activities adopted by micro broiler business owners

The marketing mix strategies are presented in Table 10.

Table 10. Marketing mix of business owners in Calabar metropolis

S/N	Marketing mix	N(1)	R(2)	S(3)	O(4)	A(5)	Sum	Mean	Rank
A	**Product**								
	Dressing of broiler birds neatly	4(4)	5(10)	40(120)	40(160)	23(115)	409	3.65	1st
	Packaging broiler meat in carrier bags	8(8)	5(10)	41(123)	43(172)	15(75)	388	3.46	2nd
	Availability of Products at all times	2(2)	11(22)	58(174)	39(156)	2(10)	364	3.25	3rd
	Storage/Preservative facility for dressed birds	4(4)	26(52)	26(78)	35(140)	2(10)	284	2.54	4th
	Grand mean							**3.23**	
B	**Pricing**								
	Adoption of competitive Pricing	1(5)	2(4)	1(3)	78(312)	30(150)	474	4.23	1st
	Use of Discount Pricing	23(23)	27(54)	47(141)	12(48)	3(15)	281	2.51	3rd
	Equating Price and quality of broiler	4(4)	2(4)	10(30)	68(272)	28(140)	450	4.02	2nd
	Offer Credit sales	33(33)	33(66)	39(117)	6(24)	1(5)	245	2.19	4th
	Temporarily reducing prices to increase short run sales	29(29)	35(70)	40(120)	5(20)	3(15)	254	2.27	5th
	Grand mean							**3.04**	
C	**Place**								
	Physical distribution of broilers to customers where they want	4(4)	4(8)	34(102)	47(188)	23(115)	417	3.72	3rd
	Selling the right quantity to the right customers at the right time	1(1)	-	5(15)	82(328)	24(120)	464	4.14	1st
	Accessibility of firm site	1(1)	1(2)	12(36)	83(332)	15(75)	446	3.98	2nd
	Sell to middlemen	5(5)	4(8)	69(207)	27(108)	7(35)	363	3.24	4th
	Grand mean							**3.77**	
D.	**Promotion**								
	Offer Special Season discount	43(43)	37(74)	31(93)	-	1(5)	215	1.92	2nd
	Free Processing of birds	65(65)	27(54)	16(48)	2(8)	2(10)	185	1.65	5th
	Advertise through sign post and fliers	61(61)	33(66)	4(12)	14(56)	-	195	1.74	4th
	House to house adverts	56(56)	27(54)	22(66)	5(20)	2(10)	206	1.84	3rd
	Place calls to customers on maintain personal contact and interpersonal communication	4(4)	7(14)	7(21)	44(176)	50(250)	465	4.15	1st
	Grand mean							**2.26**	

Note: N = Never, R = Rarely, S = Sometimes, O = often, A = Always.
Source: Field survey, 2017.

Product means the good and services combination that the firm offers to the target market. Four statements were used to measure the products offered in the market by respondents. "Dressing of broiler birds neatly" (3.65) was ranked first followed by "packaging broiler meat in carrier bags" (3.46). Storage/preservative facility for dressed birds was least with (2.54). This means that most respondents faced the risk of spoilage of broiler meat that is unsold, and this can reduce the profit margins of the enterprises.

Price refers to the amount of money that customers must pay to obtain the product or service. If customers perceive that a product price is greater than its value, they will not buy. If a producer prices a product below its cost, profit will suffer. Between the two extremes, the right pricing strategy is the one that delivers both values to the customer and profit to the producer (Kotler & Armstrong, 2013) [27]. Of the five statements used to measure the pricing abilities of respondents, "adoption of competitive pricing" ranked first (4.23) followed by "equating price and quality" (4.02).Average pricing skills by respondents of 3.04, implies that respondents were able to adopt a pricing strategy that combined both value to the customer and profit to the enterprise.

Place includes enterprise activities that makes the product available to the target customers. Five statements were used to assess place. All the statements surpassed the average of 3.00 with "selling the right quantity to the right customers at the right time ranking first (4.14). Average "place" skill was 3.77 implying that respondents were able to produce broiler birds and made them available to consumers through creating relationships with suppliers and customer as well as resellers.

Promotion includes activities that communicate the merits of the product and persuade target customers to buy it. Of the five statements measured, only "placement of calls to customers to maintain personal contact surpassed the threshold of 3.00 (4.15). The implication of this is that respondents did not strive to win new customers or even to keep the ones already had. The average figure for promotion is 2.26 implying that respondents did not take the issue of promotion seriously. This situation may be the reason why most broiler operators keep bird beyond the standard 8 weeks thereby incurring more cost and depleting profits.

CONCLUSIONS

On the managerial and marketing mixed practices adopted by the micro broiler operators, the study revealed that the entrepreneurs displayed a positive attitude to all the management practices and marketing mix activities. The study also revealed that, applying a combination of the managerial and marketing mix practices leads to better performance in terms of high output, sales and profit maximization. Indeed, if the micro broiler operators are able to harness the marketing mix and adopt a good marketing strategy that is aimed at customer satisfaction, then they will be able to make high sales and profits. Overall, good management practices and a competitive marketing strategy can help micro broiler operators achieve competitive advantage and high performance that will make them remain in business for long.

The following recommendations were made to enhance performance of micro broiler businesses in Calabar metropolis:

(i)Broiler operators should organize themselves into cooperative associations to put them in good stead to be able to access the much needed capital from funding agencies. This will enable them to be able to pay for some of the innovative technologies and inputs that are required in modern day broiler operations.

(ii) Adequate extension personnel should be deployed to provide relevant extension services to broiler operators to improve their skills and knowledge in the operation of broiler businesses.

(iii) Policy action of government should be directed towards the technical know-how and capacity utilization of micro broiler operators to enable them adopt proper business

management practices aimed at ensuring efficient resource utilization. This will bring considerable reduction in the cost of variable cost per bird and enhance competitiveness of the business.

(iv) There should be deliberate and conscious efforts to subsidize the cost of feeds and day old chicks as a policy action as well as instituting a flexible credit policy for broiler operators in the area to reduce cost and increase profits made by broiler operators.

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TAXATION OF AGRICULTURAL LAND IN THE SLOVAK REPUBLIC

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Abstract

The aim of the paper is to analyze the taxation of agricultural land in the Slovak Republic with a focus on arable land, hop gardens, vineyards, orchards, permanent grassland and to propose measures that could contribute to the adjustment of tax rates in the future. Tax decentralization has been taking place in Slovakia since 2004, thus strengthening the tax competences of local municipalities in the field of property tax. The following factors are decisive in determining the tax on agricultural land by the local government: the value of the taxable land, the tax rate and the tax administrator's ability to raise the tax rate to a maximum of 5 times the base rate declared by law. Tax administrations use the legal options and increase tax rate in multiples, which positively affects their financial budget. The persisting high tax burden on agricultural land in some municipalities increases the cost and reduces the profitability of farms.

Key words**:** *local tax, real estate or property tax, land tax, farms, tax rate, arable land price*

INTRODUCTION

Slovakia's tax harmonization with the EU tax system is progressing, this was preceded by the harmonization of the accounting systems [11]. Nevertheless, each state has its own particularities, especially in the taxation of real estate and thus in agricultural land [4]. According to [12] "when searching for arguments for justified taxation of real estate, more principles of tax justice are used very often, especially the principle of benefit and the principle of ability to pay".

The effect of the tax on the taxpayer is directly dependent on the legislative form of the applicable tax laws in a specific time period. Land tax is an important economic instrument affecting farm outcomes. The tax on agricultural land is a part of the cost that is a crucial component of economic efficiency and profitability of businesses [6]. The issue of land taxation in Slovakia was also gradually addressed in the past in the context of the impact of taxes on the costs of agricultural enterprises [1].

Taxation of land is based on its value, but the Act no. 476/2003 on Property Tax did not take into account following facts: the distance of the land from built-up area of the municipality, its size, shape and availability [14]. Experts in the relevant field take these mentioned facts into account in determining the general value of the property [2]. According to [3] "in a market economy, for the price of land, the same rules apply as for the price of any other goods and it moves with the functions of supply and demand. The land tax is particularly important for small municipalities, where it is often one important source of their budget".

The tax system of the Slovak Republic includes direct and indirect taxes. Of the direct taxes, the tax burden on primary agricultural production is crucial. Other than the income tax, it is the property taxes and in particular the land tax [13].

Tax decentralization has been taking place in Slovakia since 2004, strengthening the competences of cities and municipalities in determining the tax burden and the regular annual collection of taxes. A single rate of 0.25% for all taxes subject to agricultural land has entered into force. Until 2003, a differentiated tax rate was in place, specifically for arable land, hop gardens, vineyards and orchards (0.75%) and permanent grassland (0.25%) [7]. The appreciation of arable land by the official price of land according to cadastral areas was

3 times lower than in the current Annex no. 1 to Act no. 582/2004 Coll [15]. The official appreciation of permanent grassland has remained unchanged and is currently in force.

According to [7] "the real estate tax on agricultural land is determined by the towns and municipalities based on their value and the extent of the property and is calculated by the payer - the owner or the users, administrators. If this property such as agricultural land is in use, the tenant - the user pays the tax and if the lease relationship lasts five or more years, the lessee should be registered in the land register". The land tax is nationwide and affects all owners, agricultural land users, differentiated, depending on the tax base that is the prices of agricultural land determined by creditworthiness. The annual rate of land tax may be increased or reduced by the tax administrator according to local conditions in the municipality up to a maximum of 5 times the annual base rate resulting from the law. There are certain statutory exceptions where the land is exempt or reduced tax is levied on them [9], [10].

Act no. 582/2004 Coll. has been gradually refined several times and the possible significant effects of increasing the rate multiplier by tax administrators have been removed. The result of the solution to the issue of land taxation was at least a reduction of the possibility of 20 times the lowest annual rate of land tax, determined by the tax administrator in a generally binding regulation of the municipality, to 5-fold. Another change came into effect from October 14, 2014, which was later declared to be 5 times the tax rate specified by law (i.e. 1.25% maximum) and not by a generally binding regulation of the municipality [5]. Despite these changes and gradual refinements in the determination of the annual tax rate as well as the tax base (land value), the tax burden on agricultural land is gradually increasing, which may be the result of various factors including the increase in taxpayers, the taxable area and the statutory options for raising rates by the tax administration that is by municipalities and cities [8].

MATERIALS AND METHODS

The paper evaluates the situation in the taxation of agricultural land, which used standard methods of analysis (especially time series analysis), synthesis and comparison. The source of quantitative data was: Ministry of Finance of the Slovak Republic, DataCentrum Bratislava and National Agricultural and Food Center - Research Institute of Agriculture and Food Economics.

Tax calculations (tax burden) for 2014 - 2017 were accentuated on: the number of taxpayers, the total area of taxable parcels (non-exempt, reduced tax, exempt), prescribed tax and tax paid. We also provide information on alternative working proposals whose annual tax burden calculations were based on the product of:

- the tax base, that is the land value (according to 582/2004 Coll., Annex No.1 of the Act) without vegetation multiplied by area (and alternatively Annex to the Tax Act valid until 2003) and
- the annual tax rate

$$DZ = \sum_{i=1}^{n} VP_i HP_i RS$$

where:

DZ = total annual tax burden
VPi = land area of i-th plot
HPi = value (price) of i-th land without crop
RS = annual tax rate (constant)

ArcView software was used to compile the map outputs.

After calculations, an analysis of the tax burden at the level of Slovakia, regions, districts and informative and anticipated working variant rate proposals were prepared so that there is no significant year-on-year change in tax burden.

RESULTS AND DISCUSSIONS

Analysis of agricultural land taxation

(i)Arable land, hop gardens, vineyards, orchards and permanent grassland

Collectively for agricultural land that is for arable land, hop gardens, vineyards, orchards and permanent grassland, the prescription of

the agricultural land tax in the years of 2014 – 2017 for the Slovak Republic amounted to 31.7 mil. € in 2016 and to 33.8 mil. € in 2017 (Table 1). Taxes increased by 2.1 mil. € (6.6%) and compared to 2014 by 6.3%. In addition to the year 2016, when the volume of the prescribed tax was reduced, the comprehensive tax regulation had an annual increase. This development was influenced by the increasing number of taxpayers as well as by the increasing total area tax rate (except 2016). Long-term trends in increasing the tax burden can also be seen in the graphic representation (Fig. 1).

Table 1. Arable land, hop gardens, vineyards, orchards and permanent grassland

Indicator / year	2014	2015	2016	2017	Index 2017/2016	Index 2017/2014
Number of taxpayers	582,210	605,437	605,651	645,676	106.6	110.9
Total area of taxable land- thousands ha	2,049.5	2,110.7	2,084.9	2,220.1	106.5	108.3
Of which: - non-exempt	2,025.0	2,084.5	2,058.9	2,191.7	106.5	108.2
- with reduced tax	9.0	9.9	9.0	10.5	116.7	116.7
- tax-exempt	15.5	16.2	17.0	17.9	105.3	115.5
Current year prescribed tax in mil. €	31.8	32.5	31.7	33.8	106.6	106.3
Tax paid in mil. €	31.7	31.6	31.3	33.2	106.1	104.7

Source: Ministry of Finance of the Slovak Republic-DataCentrum, own calculations

Note: Cases where the tax paid is less than the tax prescribed resulted from the taxpayer refusing to pay the prescribed tax amount. Cases where the tax paid is higher than the tax prescribed resulted from the fact that the taxpayer paid the rest of the previous years.

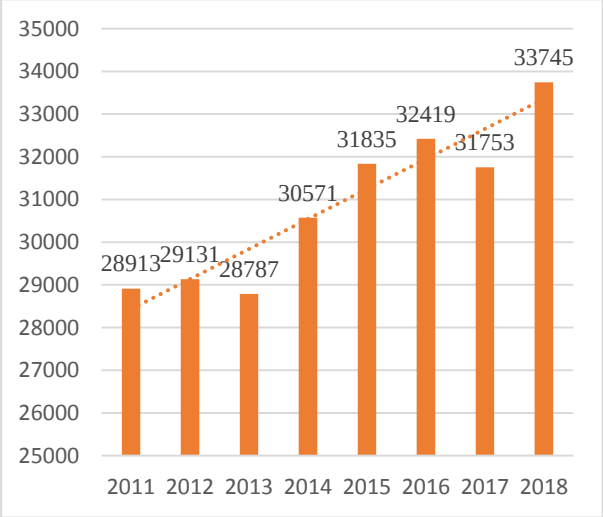


Fig. 1. Development of tax burden in 2011 -2018 in ths. €

Source: Ministry of Finance of the Slovak Republic - DataCentrum

(ii)Arable land, hop gardens, vineyards, orchards

For the group of soils - arable land, hop gardens, vineyards and orchards - the agricultural land tax regulation in the individual years 2014 - 2017 for the SR (Table 2) was represented by the volume from 30.2 mil. € in 2014 to 32.0 mil. € in 2017, an increase of € 1.8 million. € (6.0%). Except for the year 2016, when the volume of the prescribed tax was reduced, its volume tended to increase annually. This development was influenced by the increasing number of taxpayers (except 2016) as well as by the increasing total tax area subject to areas (except 2016), in particular non-exempt.

Table 2. Arable land, hop gardens, vineyards, and orchards

Indicator / year	2014	2015	2016	2017	Index 2017/2016	Index 2017/2014
Number of taxpayers	398,999	411,450	408,229	432,274	105.9	108.3
Total area of taxable land - thousands ha	1,377.0	1,404.7	1,395.9	1,489.2	106.7	108.1
Of which: - non-exempt	1,362.0	1,388.4	1,380.5	1,470.7	106.5	108.0
- with reduced tax	6.6	7.3	6.7	8,0	119.4	121.2
- tax-exempt	8.4	8.9	8.7	10.5	120.7	125.0
Current year prescribed tax in mil. €	30.2	30.8	30.2	32.0	106.0	106.0
Tax paid in mil. €	30.2	30.0	29.8	31.6	106.0	104.6

Source: Ministry of Finance of the Slovak Republic-DataCentrum, own calculations.

(iii)Permanent grassland

The amount of the prescribed tax on agricultural land for permanent grassland amounted to 1.8 mil. € (Table 3), which was by 0.3 mil. € (20.0%) more and compared to 2014, the amount of the prescribed tax increased by 0.2 mil. € (12.5%). The tendency to increase the prescribed tax (except for 2016) was due to the increasing number of taxpayers as well as the total tax area subject to permanent grassland areas.

Table 3. Permanent grassland

Indicator / year	2014	2015	2016	2017	Index 2017/2016	Index 2017/2014
Number of taxpayers	183,211	193,987	197,422	213,402	108.1	116.5
Total area of taxable land in thousands ha	672.5	706.0	689.0	730.9	106.1	108.7
Of which: - non-exempt	663.0	696.1	678.4	721.0	106.3	108.7
- with reduced tax	2.4	2.6	2.3	2.5	108.7	104.2
- tax-exempt	7.1	7.3	8.3	7.4	89.2	104.2
Current year prescribed tax in mil. €	1.6	1.7	1.5	1.8	120.0	112.5
Tax paid in mil. €	1.5	1.6	1.5	1.6	106.7	106.7

Source: Ministry of Finance of the Slovak Republic-DataCentrum, own calculations.

The data on land tax show that in 2017, in comparison with 2016, the volume of land tax on agricultural land increased by 2.1 mil.

On the basis of the analysis we can state that there is a gradual increase of tax not so much between years as tax administrators respect the legal possibility of tax increase up to 5 times the average annual rate, that is a maximum of 1.25%, but a gradual year-on-year effect, with a more marked increase by comparing the prescribed tax between 2014 and 2017 (or from 2010 onwards). According to regions (Table 4), the highest increase in the prescribed tax between 2017/2016 was in the Košice region (15.2%), Prešov region (8.4%) and Trenčín region (9.8%).

A more significant increase in the tax regulation was between 2010 and 2017, although in 2010 it was possible to increase the tax rate up to 20 times the general binding regulation of municipalities and in 2017 only up to 5 times the basic rate declared by law.

The total amount of the prescribed tax varies by region. The highest amount of the prescribed taxes on the total amount of taxes for agricultural land in 2017 (Fig. 2) was in Nitra region (33.7%) and Trnava region (24.6%), which was related to the highest tax rates subject to the area as well as higher land quality expressed by the price entering the tax base.

Local and municipal governments complement their budgets with tax on forest land, which is more represented in these areas, in areas less taxed on agricultural land, given the price of land.

Table 4. Tax burden by region in 2010 - 2017 (in thousands of €)

Region	**2010**	**2011**	**2012**	**2013**	**2014**	**2014**	**2016**	**2017**	**17/10**	**17/14**	**17/16**
Bratislava region	1,734	1,776	1,767	1,963	2,028	2,037	2,006	2,151	124.1	106.1	107.2
Trnava region	7,571	7,073	7,158	7,613	7,944	8,053	8,135	8,300	109.6	104.5	102.0
Trenčín region	1,589	1,597	1,593	1,683	1,968	1,914	1,863	2,045	128.7	103.9	109.8
Nitra region	10,038	10,947	10,579	10,940	11,220	11,285	10,572	11,360	113.2	101.2	107.5
Žilina region	718	747	735	779	822	834	830	889	123.9	108.2	107.1
Banská Bystrica region	2,292	2,295	2,332	2,676	2,584	2,695	2,927	2,894	126.3	112.0	98.9
Prešov region	1,717	1,727	1,703	1,795	1,964	2,114	2,052	2,225	129.6	113.3	108.4
Košice region	3,254	2,970	2,920	3,123	3,305	3,487	3,368	3,880	119.2	117.4	115.2
Slovak Republic	28,913	29,131	28,787	30,571	31,835	32,419	31,753	33,745	116.7	106.0	106.3

Source: Ministry of Finance of the Slovak Republic-DataCentrum, own calculations.

The comparison of the tax increase tendency between 2017 and 2016 at the district level shows that in almost all districts of Slovakia (except for nine) there was an increase in tax regulations and this was differentiated. The biggest increase was recorded in the districts

of Svidník (39.7%), Trebišov (33.1 %,) Banská Štiavnica (25.9%), Sobrance (18.7%), Revúca (15.9%) Stropkov (15, 4%), Žarnovica (15.3%).

Greater growth of the tax regulation was in the years 2017 and 2014 in the districts of Svidník (53.7%), Banská Štiavnica (52.4%), Stropkov (40.4%), Trebišov (36.0%), Nové mesto nad Váhom (30.5%), Bardejov (30.3%).

According to the spatial representation on the maps, we see the highest and lowest tax burden of agricultural land by districts in 2017, as well as differentiated by arable land, hops, vineyards and orchards, TTP (Maps 1-3) and changes in tax burden between 2017 and 2014 (Map 4).

The comparison of changes in tax regulations between 2017 and 2016 documents a gradual increase in the tax burden on agricultural lands most in the southern districts of Slovakia, which was reflected in the total volume of the prescribed tax. Changes in the tax burden between 2017 and 2014 are more documented on Map 4.

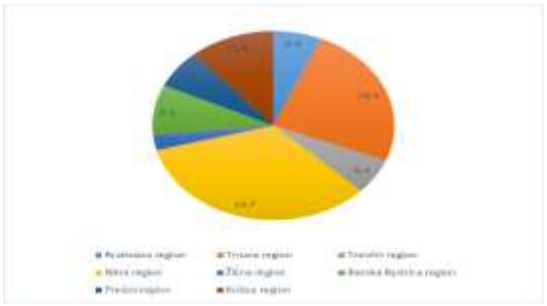
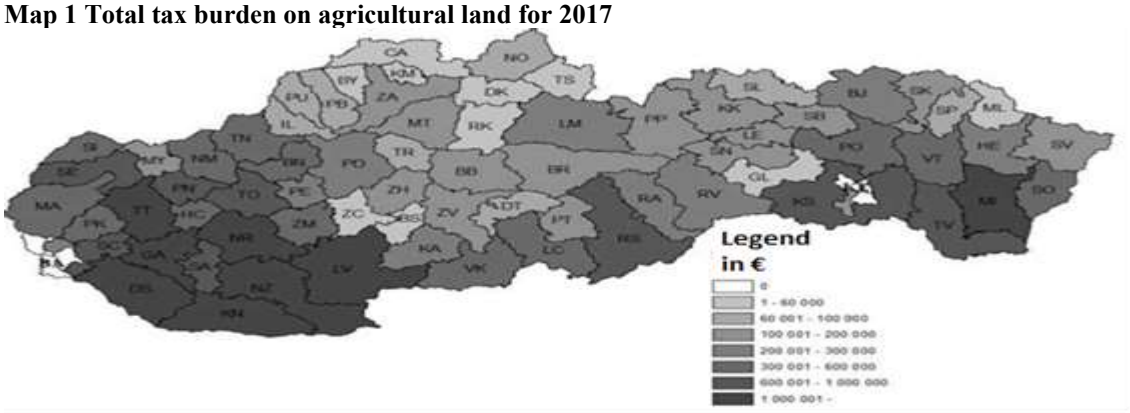


Fig. 2. Share of Land Tax Regulation in the Slovak Republic for 2017 by Region (%)
Source: Ministry of Finance of the Slovak Republic-DataCentrum

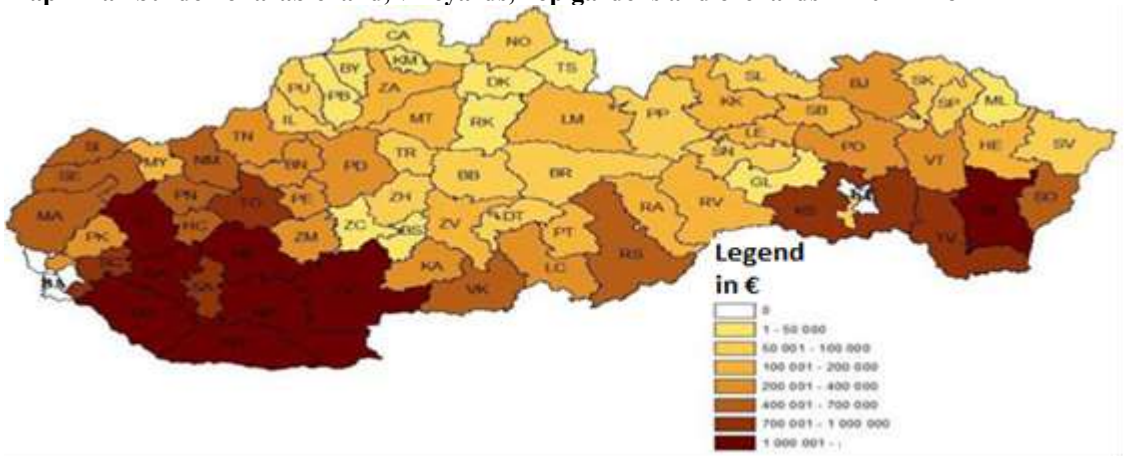
In individual cases (due to the anonymity of company data, we do not mention them), there was an even higher increase in the agricultural land tax regulation than was the case for the Slovak Republic, regions or districts.

Map 1 Total tax burden on agricultural land for 2017



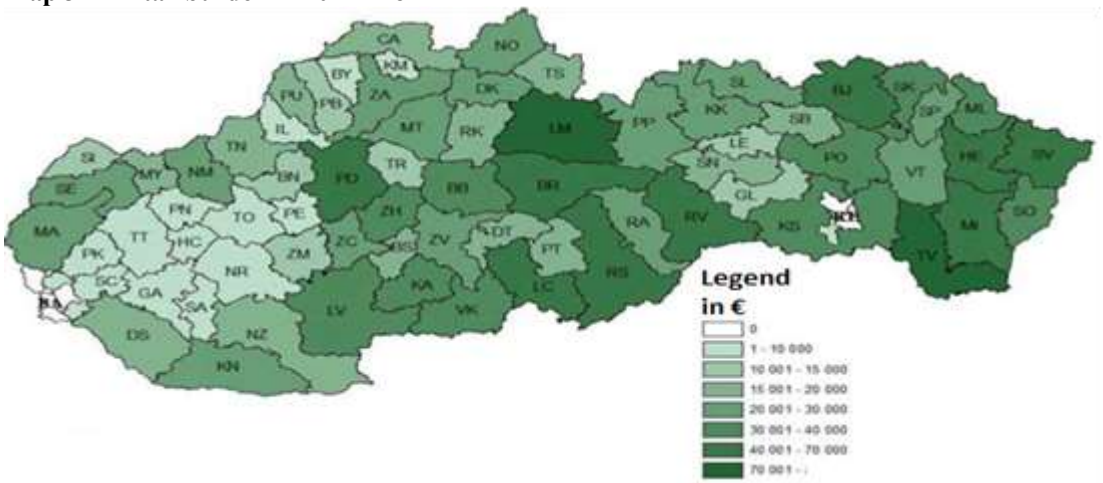
Source: processed by authors, output of ArcView software based on the data of Ministry of Finance of the Slovak Republic-DataCentrum.

Map 2 Tax burden of arable land, vineyards, hop gardens and orchards in 2017 in €



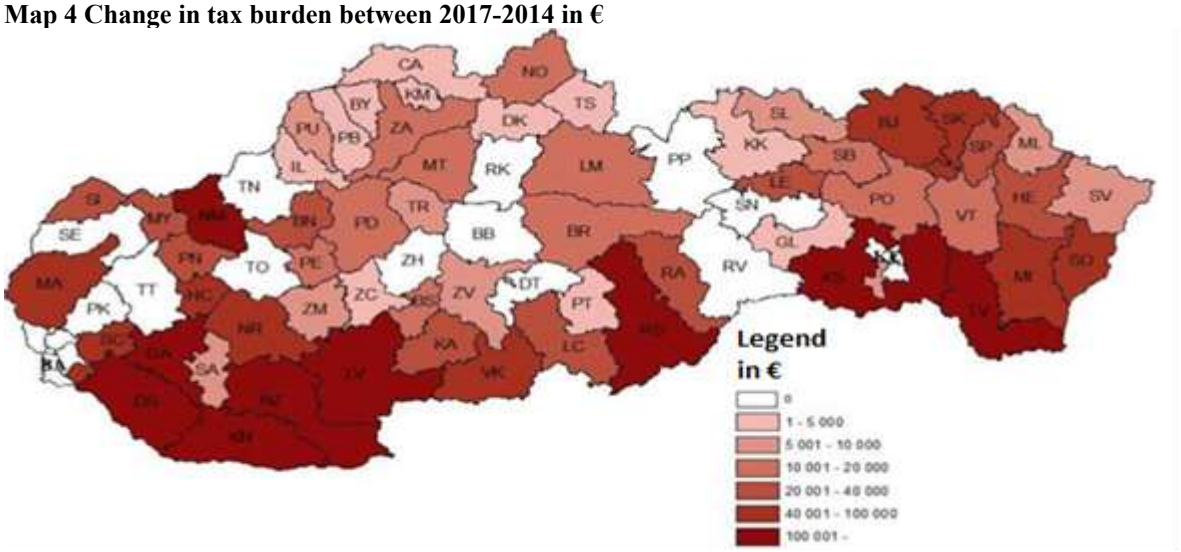
Source: processed by authors, output of ArcView software based on the data of Ministry of Finance of the Slovak Republic-DataCentrum.

Map 3 TTP tax burden in 2017 in €



Source: processed by authors, output of ArcView software based on the data of Ministry of Finance of the Slovak Republic-DataCentrum.

Map 4 Change in tax burden between 2017-2014 in €



Source: processed by authors, output of ArcView software based on the data of Ministry of Finance of the Slovak Republic-DataCentrum.

Alternative proposals for setting the tax rate on agricultural land

Two versions of variations to the agricultural land tax rate variations, which could be used to adjust the tax burden in the future (Table 5 and Table 6), are presented in an informative way. The calculations were based on two versions, different from each other in the use of arable land valuation and permanent grassland. Each version contains 4 variants. For each variant, differentiated tax rates were envisaged separately for arable land as well as separately for grass grassland.

Version 1. In all 4 variants of version 1, the tax volume was calculated from the tax base that is according to the value (valuation) of arable land and permanent grassland listed in Annex no. 1 of Act no. 582/2004 Coll. and the amount of taxable areas in 2017. The value of arable land, which is listed in Annex no. 1 to Act no. 582/2004 Coll. is 3 times higher than the value of the soil previously valued at the Research Institute of Agriculture and Food Economics in collaboration with the Research Institute for Soil Science and was the basis for the Annex to the Agricultural Land Tax Act until 2003. The calculated rates for versions 1 to 4 could be applied across the board, provided that the tax administrator will not be allowed to raise the tax rate compared to the base rate, as is currently the case up to 5 times, but only up to 2 or 3 times the base rate

currently in force, which would stop the tax regulation from rising and stabilize it roughly at the level of the 2017 tax rate.

Table 5 Agricultural Land Tax in the SR - Version 1

Variant	Multiple from base rate 0.25 %		Calculated tax rate in %		Calculated tax in €			Difference from tax prescribed in 2017 in €
	OP	**TTP**	**OP**	**TTP**	**OP**	**TTP**	**PP combined**	**TTP combined**
1	1.63	2.47	0.40	0.61	31,952,046	1,192,585	33,144,631	0
2	1.69	1.00	0.422	0.25	33,110,895	126,266	33,891,161	+ 152,531
3	1.72	1.20	0.430	0.30	33,199,128	811,519	34,611,241	+ 926,616
4	1.76	1.20	0.44	0.30	34,585,168	811,519	35,451,281	+ 1,112,656

Source: Ministry of Finance of the Slovak Republic-DataCentrum, own calculations.
Note: arable land, hop gardens, vineyards and orchards (OP), permanent grassland (TTP), agricultural land (PP)

This version would require an amendment to the law where the land tax rate for land (arable land, hops, vineyards, orchards and permanent grassland) could not exceed today's 5 times, but only 3 times the annual land tax rate.

Version 2 - In this version and in all its 4 variants, the tax rate was calculated according to the original arable land and permanent grassland valuation (elaborated in the past from the Research Institute of Agriculture and Food Economics documentation) and the area was the taxable area in 2017. The value of arable land used for this version is 3 times lower than the value of arable land listed in Annex no. 1 to Act no. 582/2004 Coll. on Local Taxes and Local Fee for Municipal Waste and Small Construction Waste as amended. For this reason, higher tax rates have been set than the current ones.

For the calculation of all average prices for cadastral areas, a single price list of arable land and permanent grassland was used according to the bonito-ecological units (BEU), which was part of the Bonitation Bank of the Research Institute of Agriculture and Food Economics in the past.

Table 6. Agricultural Land Tax of the Slovak Republic - Version 2

Variant	Multiple from base rate 0,25 %		Calculated tax rate in %		Calculated tax in €			Difference from tax prescribed in 2017 in €
	OP	**TTP**	**OP**	**TTP**	**OP**	**TTP**	**OP combined**	**TTP combined**
1	4.88	2.47	1.219	0.617	31,952,046	1,792,585	33,744,631	0
2	4.88	2.48	1.220	0.619	31,965,634	1,798,234	33,763,868	+ 19,238
3	4.88	2.48	1.221	0.619	31,991,835	1,798,234	33,790,070	+ 45,439
4	1.548		0.387		-	-	33,792,534	+ 47,903

Source: Ministry of Finance of the Slovak Republic-DataCentrum, own calculations.
Note: arable land, hop gardens, vineyards and orchards (OP), permanent grassland (TTP), agricultural land (PP)

This version would require an amendment to the current tax law no. 582/2004 Coll. as amended by Act no. 538/2007 Coll., on one hand by adjusting the annual rate of land tax to be differentiated separately for arable land and separately for permanent grassland and to set the amount of the annual tax regulation at the 2017 level. Furthermore, this version would require the amendment of the Annex from the current values to more objective values based on the respective rates of bonito-ecological units, which are averaged up to 3 times lower on arable land, or the introduction of a legislative reference to Decree no. 38/2005 Coll. In variant 4 of this version, the law would set a uniform tax rate for arable land and for permanent grassland, whereby the tax administrator could increase it to a maximum of 3 times the rate declared by law.

Both versions are expected to halt the gradual increase in agricultural land tax. The elements of these two versions could also be appropriately combined within the legislative amendment itself so that the tax on agricultural land is calculated from a more realistic basis based on the value of agricultural land designated under the BEU. However, in order to objectively and as accurately as possible determine the tax base for agricultural land, a systematic updating of

the basis for determining the value of agricultural parcels, in particular on the classification of agricultural parcels into BEUs, as well as current production and cost parameters for the determination of agricultural value, should be provided by BEU, what is currently very difficult.

CONCLUSIONS

In relation to the applied land tax, the tax burden on agricultural land was analyzed by the land tax, which increases the cost of farms and has a negative impact on their profitability. Based on our analyses we can state that there has been a successive increase in the levied amount of farm land tax. This has been caused by several factors, for instance higher number of taxpayers, the increase in taxable areas as well as applying maximal legal increases in multiples of base tax rates.

The prescribed tax depends on the decision of the tax administrator - cities and municipalities. In this context, it would be appropriate to carry out investigations - local surveys on several farms, representing the territorial administrative classification and production focus, and to analyze the development of the tax burden over the last four years. In determining the tax on agricultural land by the local and regional authorities, the decisive factor is, among others, the value of the land tax, the tax rate and the tax administrator's ability to raise the tax rate to a maximum of 5 times the base rate declared by law. Tax administrations use legal options and increase tax rate multiples, which positively affects their financial budget.

The proposed working proposals represent changes to simplify the calculation of the agricultural land tax and limit the disproportionate increase in the annual tax rate on agricultural land by the tax administrator. The upper limit of the tax rate is designed not to negatively affect municipal budgets and remain costly for users and landowners at the 2017 level. The proposals are informative, require further discussions in particular on agricultural land prices, which would require a re-evaluation of the soil's creditworthiness in view of the climate changing and hence the use of agricultural land, the demand for land as a sustained investment value not subject to inflation.

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IMPROVEMENT OF THE EFFICIENCY OF RESOURCE POTENTIAL USE OF AGRICULTURAL ORGANIZATIONS IN THE NOVOSIBIRSK REGION, RUSSIA

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Abstract

Higher output of competitive and high-quality agricultural products implies the more efficient use of the resource potential held by agricultural organizations. In the modern conditions, it is essential to substantiate indicators and conditions in order to improve the efficiency of the resource potential and to determine resource potential needs for the manufacture of agricultural products. The agroindustrial complex resource system aims to improve the efficiency of its use. The entry into the resource potential system includes the attraction of main production factors (labor, land, capital, entrepreneurship). The resource potential system is used as a subsystem of a region's economic potential. The exit from the system constitutes the more efficient use of the resource potential. The exit from the resource potential system is the entry into the production potential system with a view to manufacturing agricultural products. An agricultural organization's resource potential is a transparent production system, in which entrepreneurship, taking into account the prevailing market conditions, the modern development level of production forces and production relations, unites, in an optimal combination, in an organization of the relevant organizational-legal form and puts into action technologically dependent factors of agricultural production (labor, land, capital). In the article, the authors substantiate conditions and targets for the efficient use of the resource potential. Taking into account innovative development and achievements of leading companies, resource needs for grain and milk output have been determined.

Key words**:** *agriculture, efficiency of use, resource potential, agricultural organization, production forecast*

INTRODUCTION

Improved qualitative features of the agroindustrial complex and higher quantitative numbers of economic efficiency are directly related to improved efficiency and use of the resource potential in agricultural organizations [15, 16].

The economic efficiency of agriculture is expressed in its designation, i.e. to provide the country's population with food in compliance with the recommended consumption rates [1, 2].

In order to protect national interests, it is necessary to provide the country's food security, to increase the output of agricultural products at domestic agricultural facilities [4].

The development of the market economy and Russia's integration into the global economic space have made it necessary to enhance competitiveness and quality of manufactured agricultural products, which implies a much higher efficiency of resource potential use in agricultural organizations [5, 6].

Investment policy, scientific-technical achievements and the pace of their introduction to agricultural production, the efficiency of work performed by senior executives and some other factors influence the efficiency of resource use. In modern conditions, it is necessary to substantiate indicators and conditions for the more efficient use of the resource potential and to determine resource potential needs for the manufacture of agricultural products [9, 10].

Studies that are aimed to improve the efficiency of resource potential use and to create conditions for stable production are, therefore, relevant and important for the national economy.

MATERIALS AND METHODS

The research aims to develop theoretical provisions and practical recommendations on measures to improve the efficiency of resource potential use in agricultural organizations for the purpose of manufacturing quality and competitive agricultural products to satisfy the needs of the population.

The object of the research is economic and organizational relations that arise in the course of agricultural production in the region.

The subject of the research is conditions, factors, and principles that contribute to improving the efficiency of resource potential use.

Agricultural organizations in the Novosibirsk region are facilities under review.

The theoretical basis of the research included fundamental provisions of the economic theory, works written by scientists about the problem under review, legislative acts adopted by the Russian Federation, including in the Novosibirsk region.

The methodological basis of the study is the dialectic principles and methods of scientific knowledge, a systematic approach to the study of problems of managing agricultural production. Concepts and conclusions, developed by the classical and modern economic theory of the fundamentals of agricultural development, as well as the methods of its management, became the theoretical basis of this study.

In the course of the research, we used data from the Federal State Statistics Service, including its directorate in the Novosibirsk region, plans and reports compiled by agricultural organizations, special literature and reference books.

The analysis and generalization of scientists' theoretical developments constitute the theoretical importance of the research.

As for the practical importance of the research, its results can be used for the more efficient use of the region's resource potential, to adjust agricultural development programs, and to correct the government program on agricultural organization development taking into account substantiated numbers of production efficiency. Materials of the research are used by the Ministry of Agriculture of the Novosibirsk region, large, medium and small businesses, executives of agricultural enterprises, and investors who inject funds into agricultural production and upgrade. The following methods were used in the course of the research: monographic, analytical, abstract logical, and calculation constructive.

RESULTS AND DISCUSSIONS

Targets and conditions for more efficient use of resource potential in agricultural organizations

The determination of the optimal ratio for resource potential in agricultural organizations is associated with a number of peculiarities, and for this reason, individual parameters of each enterprise are unique. However, the degree, in which agricultural organizations are provided with agricultural machinery, their performance and numbers of resource potential use should be reflected via specific numbers and economically justified. These numbers should be translated into corporate development strategies [11, 12].

We used experience amassed by the Novosibirsk region's leading companies to determine the efficiency of resource potential use. For this purpose, we chose agricultural organizations that are interested in unleashing possibilities of their HR potential and, as a consequence, in introducing scientific-technical achievements. They are agricultural organizations, which are part of consortium Scientific Educational Agroindustrial Cluster of the Novosibirsk region and cooperate with the Novosibirsk State Agrarian University (NSAU) in order to achieve the consortium's goals. NSAU is a key educational institution within the consortium which was established in 2012 [13].

Namely, they are agricultural organizations Lebedevskaya, Siberian Niva, Krutishinskoye, Pushkin Collective Farm, Politotdelskoye, Shipunovskoye, Kirov CJSC, Bobrovskoye,

Agricultural Production Complex Kirzinsky, Pedigree Farm Uchkhoz Tulinskoye, and Pedigree Farm Irmen. As Pedigree Farm Irmen numbers substantially differ from leading companies' average. They were put in a separate column and can be used as benchmarks for enterprises whose performance indicators are currently above the average (Table 1).

Table 1. Efficiency targets for resource potential use under various scenarios

Indicator	Pedigree Farm Irmen conditions	Leading agricultural organizations in the Central Eastern Zone
Strength of influence of entrepreneurship	1.05	0.82
Provision with funds, thousand rubles per person	902.0	1,167.5
Return on funds	1.70	0.75
Fund capacity	0.59	1.99
Profit (loss) per 100 hp, thousand rubles	409.7	93.2
Milk yield, kg	10,998	6,570
Expenses per 100 hp of energy facilities, thousand rubles per hp	1,546.5	1,535.3
Per-employee profit, thousand rubles	364	54.5
100 hectares of the agricultural land account for		
fixed assets, thousand rubles	3,806.1	3,209.1
investment, thousand rubles	1,010.2	270.9
operating expenses, thousand rubles	5,882.7	2,468.9
employees, persons	4.3	2.7
profit, thousand rubles	1,559.0	149.9
milk produced, tons	121.9	48.4
grain and beans produced, tons	184.5	73.7
labor productivity per 100 kg, man-hours		
of milk	0.89	2.1
of grain	0.35	0.38

Source: compiled by the authors.

Table 2. Conditions and factors for higher efficiency of the resource potential use and the assessment of their influence on the efficiency of resource potential use

Condition	Factors and reserves	Growth factor for the efficiency of resource potential use	Value, %
1.Presence of a long-term development strategy (up to 20 years)	presence of a target, mobilization of the team's possibilities	profit growth	80%
		production growth	60%
		expansion of the market share	60%
2.Organization of a system aimed to train staff and improve their qualification, with an equal attitude to the training of executives, specialists and workers	guarantee of the quality of production processes; improved quality of products; improved seed grain; rational fertilizer use; safety of machinery and equipment; longer operating potential of vehicles; lower consumption of resources, labor satisfaction	higher class of grain and milk; higher selling prices	30%
		lower production costs	30%
		higher labor productivity	20%
		higher wages	15%
		higher milk yield per cow	40%
		higher grain crop	20%
3. Forward-looking introduction of high-efficiency technologies when operating modern equipment	higher labor productivity; formation of careful attitude to resources; "anchoring" of employees in an enterprise	lower production costs	30%
		higher labor productivity	80%
		higher milk yield per cow	40%
4. Investment activities (presence of economically justified investment projects)	higher labor productivity; formation of careful attitude to resource potential elements; "anchoring" of employees in an enterprise	higher grain crop	20%
		higher wages	75%
5. Creation of youth-friendly jobs and safe working conditions			
6. Introduction of the measures aimed to raise wages			
7. Development of the measures focused on the social support of employees			

Source: compiled by the authors.

Of the aggregate of the relevant agricultural organizations that meet the main requirement, leading enterprises in the Central Eastern nature economic zone were differentiated on the basis of the following criteria: the factor that influences entrepreneurship of above 0.75, annual revenue of RUB 100+ million, the presence of dairy cattle and grain production, 100+ on payrolls, and the presence of a development strategy [14].

Upon analysis of the strategies in cooperation with specialists and executives of agricultural organizations that take an active part in the consortium's operation, generalized conditions and factors that contribute to improving the efficiency of resource potential use and the economically justified results of their influence (Table 2).

Resource needs for grain and milk production until 2025

The calculated efficiency targets for the use of production resources in agricultural organizations that operate in the Novosibirsk region make it possible to apply them as one of the tools for modeling a development scenario for agricultural production in the region.

The region produces various agricultural goods. Two types of products (grain and milk) will be used as the basis for calculations. We use one ton of grain per capita as a ratio of full satisfaction of the needs of the national economy. Pursuant to the recommendations given by the Ministry of Healthcare and Social Development of the Russian Federation, we took needs for milk and dairy products per capita at the upper bound, i.e. 340 kg [17, 18].

The Novosibirsk region's population in the future is calculated using the extrapolation method on the basis of the identified tendency according to an equation of the trend:

$$y_t = a + bt = 2{,}687.27 + 7.6t.$$

Agricultural organizations covered 78% of all areas under crop in 2014. Consequently, their needs for milk and grain production should be at least 78%. Milk and grain produced by agricultural organizations in 2014 accounted for 66.3% and 68.9% of the production needs, as we calculated, taking into account the area under crop equal to 78% [19, 20].

We will calculate two scenarios for three development models (the first one for milk production, and the second one for grain output) (Table 3).

Table 3. Calculation of resource potential needs aimed to satisfy the needs for the manufacture of main types of products under various scenarios

Indicator	In the conditions of the Novosibirsk region		In the conditions of Pedigree Farm Irmen		In the conditions of leading agricultural organizations	
	Model 1		Model 2		Model 3	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
Output (growth), thousand tons						
grain and beans, thousand tons	590.2					
milk, thousand tons	245.3					
Additional needs for						
agricultural needs, thousand hectares	1,931.5	1,725.7	201.2	320.8	506.8	800.8
employees, persons	19,315	17,257	8,653	13,793	13,684	21,621
fixed assets, RUB million	16,672.7	14,896.5	7,659.0	12,208.4	16,263.7	25,698.5
annual investment, RUB million	1,778.9	1,589.4	2,032.8	3,240.3	1,372.9	2,169.4
Investment needs for						
fixed assets, RUB million	18,451.6	16,485.9	9,691.8	15,448.7	17,636.6	27,867.9
working capital, RUB million	19,351.7	17,289.8	11,836.0	18,871.7	12,512.4	19,771.0
Total needs for financial resources, RUB million	37,803.3	33,775.7	21,527.8	34,320.4	30,149.0	47,638.9
Expected results: profit, RUB million	2,646.1	2,364.2	3,136.7	5,001.3	759.7	1,200.4

Source: compiled by the authors.

To ensure required grain and milk output in the real development conditions, the agricultural sector's investment needs vary from RUB 16.5 billion to RUB 18.5 billion in fixed assets and from RUB 17.3 billion to RUB 19.4 billion in working capital. All in all, under Model 1, agricultural organizations' investment needs for production range from RUB 33.8 billion to RUB 37.8 billion.

Based on the achievements made by leading agricultural organizations in the Central Eastern Zone the agricultural sector's investment needs range from RUB 30.1 billion to RUB 47.6 billion, including from RUB 17.6 billion to RUB 18.5 billion in fixed assets, and from RUB 12.5 billion to RUB 19.8 billion in working capital.

The most favorable option is Option 1 of Model 2 in the conditions of intensified production based on the Pedigree Farm Irmen option. This option offers the most acceptable conditions in terms of both the area of agricultural land (201,200 hectares are required) and financial resources (RUB 21.5 billion) [3]. In the current conditions of the region's development, it is not reasonable to apply the calculated Model 1 options because this requires more resources.

The most realistic option in the current conditions is given in Option 1 of Model 3, with the needs for agricultural land equal to 506,800 hectares, and RUB 30.1 bn of financial resources.

The implementation of the State Program also implies the intensification of production. However, funds are used more efficiently when introducing advanced experience. Under Model 2 (Pedigree Farm Irmen conditions), grain output will increase by 62.1%, milk production will increase by 70.2%, i.e. above the numbers as provided for in the State Program (14.8%). Labor productivity in grain output will grow by 6.3% and milk output will rise by 38.9%, while financial needs will be lower by RUB 4 billion, and workforce needs will be higher by 4,787 people. However, this company's indicators are currently not typical for the region.

In modern conditions, the most preferable development scenario is the one that was calculated based on Model 3. In this model, grain and milk production will expand by 60%, labor productivity will double, financial needs in this development model are higher by RUB 4.6 billion, and workforce needs are higher by 9,815 people.

Table 4. Forecast for grain and milk output by agricultural organizations in the Novosibirsk region until 2025 under various models for higher efficiency of resource potential use, thousand tons

Period	Output				Deficit (-) or surplus (+) of production			
	Model 2		Model 3		Model 2		Model 3	
	milk	grain	milk	grain	milk	grain	milk	grain
2014	483.2	1,304.7	483.2	1,304.7	-245.3	-590.2	-245.3	-590.2
2015	507.1	1,363.3	504.3	1,361.7	-221.7	-532.4	-224.5	-534.0
2016	532.3	1,424.5	526.3	1,421.1	-198.5	-476.4	-204.5	-479.8
2017	558.6	1,488.4	549.3	1,483.1	-174.2	-417.8	-183.5	-423.1
2018	586.3	1,555.2	573.3	1,547.9	-148.5	-356.3	-161.5	-363.6
2019	615.3	1,625.0	598.3	1,615.4	-121.6	-291.7	-138.6	-301.3
2020	645.8	1,698.0	624.4	1,686.0	-93.1	-223.9	-114.5	-235.9
2021	677.8	1,774.2	651.7	1,759.6	-63.1	-152.9	-89.2	-167.5
2022	711.4	1,853.9	680.1	1,836.4	-31.5	-78.6	-62.8	-96.1
2023	746.6	1,937.1	709.8	1,916.5	1.7	-0.6	-35.1	-21.2
2024	783.6	2,024.1	740.8	2,000.2	36.7	81.2	-6.1	57.3
2025	822.4	2,114.9	773.1	2,087.5	73.4	166.8	24.1	139.4
2020 as % vs. 2014	133.7	130.1	129.2	129.2	-	-	-	-
2025 as % vs. 2014	170.2	162.1	160.0	160.0	-	-	-	-

Source: compiled by the authors.

Forecast grain and milk output by the Novosibirsk region's agricultural organizations until 2025

Scheduled growth of milk and grain output will exceed the indicators stipulated in the Forecast for Long-term Socio-Economic Development of the Russian Federation for the Period until 2020, which during the period from 2011 through 2030 should constitute 101.2% and 101.7% [7, 8]. Our forecast for Model 2 growth rates is 1.0495 for milk output and 1.04489 for grain production, and 1.04365% for Model 3. Under Model 2, a shortage in milk production, according to the forecast, will be eliminated by 2023, a shortage in grain output will disappear by 2024, and under Model 3, by 2025 and 2024, respectively (Table 4).

If the efficiency of resource potential use rises, agricultural product output in agricultural organizations can result in a surplus of milk and grain as of 2024. Milk exports will grow up to 73,000 tons and grain exports will increase to 166,800 tons by 2025.

CONCLUSIONS

In modern conditions, resource potential has been more efficiently used in the Novosibirsk region. Labor productivity in the manufacture of main categories of agricultural products is on the rise. Agricultural product output per 100 hp increased by 34.7 times from 2000 through 2014, while profit per 100 hp increased by 12.4 times and costs per 100 hp increased by 9.5 times.

For qualitative growth of the efficiency of resource potential use and higher output, the following conditions are necessary: presence of a long-term development strategy for the agricultural organization for 20+ years; organization of a personnel training system and improvement of their qualification; introduction of high-efficiency technologies and machinery; investment activities and equipment upgrade; creation of youth-friendly jobs and safe working conditions; higher wages; social support of employees.

The following targets for the efficiency of resource potential use have been calculated for agricultural organizations whose performance indicators are lower or higher than the numbers reported by leading enterprises. The strength ratio of influence of entrepreneurship is 0.82-1.05, the provision with funds is RUB 900,000 – RUB 1,200,000, return on funds is 1.99-0.59, profit per 100 hp is RUB 93,200 – RUB 409,700, milk yield is equal to 6.6-11 tons, expenses per 100 hp are RUB 1.5 million, and per-employee profit is RUB 55,000 – RUB 364,000, respectively. Per 100 hectares of agricultural land fixed assets total RUB 3.2-3.8 million, investment stands at RUB 270,000 – RUB 1,000,000, operating expenses amount to RUB 2.5-5.9 million, employees equal 2.7-4.3 persons, profit totals RUB 150,000 – RUB 1.6 million, milk output amounts to 48-122 tons, production of grain and grain legumes totals 74-185 tons, respectively. Labor productivity per 100 kg of milk is equal to 2.1-0.89, and 0.38-0.35 man-hour for grain output. These numbers should be taken into account by enterprises as benchmarks in the course of strategic planning.

Under Option 1 for the leading agricultural organization, Pedigree Farm Irmen, financial needs for grain and milk production equal RUB 21.5 billion, or lower by RUB 4 billion, while workforce needs are higher by 4,787 people compared to the numbers stipulated in the State Program "Development of Agriculture and Regulation of Agricultural Product, Raw Material and Food Markets in the Novosibirsk region for 2015-2020".

Under this model, grain and milk output will rise by 62.1% and 70%, respectively, by 2025, i.e. will exceed the production growth as stipulated in the State Program (14.8%). Labor productivity in grain output exceeds the Program-stipulated number by 6.3%, and milk production by 38.9%. According to this model of development, the deficit in milk output will be eliminated by 2023 and the deficit in grain production will disappear by 2024.

Financial needs for higher grain and milk production (+60%) on the basis of a development model for leading enterprises in the Central Eastern Zone are equal to RUB 30.1 billion, or higher than the amount

stipulated in the development program by RUB 4.6 billion, workforce needs are higher by 9,815 people, and labor productivity is 2 times higher compared with the program. Agricultural land needs to amount to 506,800 hectares. Under this model of development, a deficit in milk and grain production will be eliminated by 2025 and 2024, respectively.

If the resource potential is used more efficiently, higher agricultural product output will make it possible to raise milk and grain exports to 73,000 tons and 166,800 tons by 2025. However, the State Program needs adjusting.

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REGULATORY AND PRODUCTION METHOD OF STIMULATING LABOR IN PROCESSING ENTERPRISES OF AGROINDUSTRIAL ON THE EXAMPLE OF SARATOV REGION, RUSSIA

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Abstract

A universal algorithm of the regulatory and production method of labor incentive based on a systematic approach has been developed. Grade remuneration system has been adapted to the tariff network based on the ranking of inter-qualifying grades, prices for products have been calculated depending on the financial condition of the company, a method has been proposed for determining the regulatory and market payroll fund. The calculation of the coefficient of labor efficiency on the basis of a percentage of revenues revealed the market value of labor — its size is 4.2 times higher than the minimum wage in the Saratov region per month per employee for dairy enterprises in the region.

Key words**:** *regulatory and production method; tariff network; grade system; ranging; normative documents*

INTRODUCTION

Regulatory and production method of labor stimulation is based on the concept of human resource management, which is closely interconnected with the theory of process management [5].

The authors used Hay's method for evaluating labor in many countries as the basis for our research [4].

The model "inputs-transformation-outputs" in the Hay technique has the form: "know-how – problem solving – accountabilities". Each model element can be subdivided into 8 elements of the value of the position. All jobs are grouped around the main central position or target salary. On the other hand, extended ranges provide greater flexibility in the remuneration system and allow for a greater degree of consideration of individual merit. Often, the market value of labor is used, serving as a starting point for determining ranges. For grading, the average salary for each position is used, according to the organization's staffing table. Both approaches complement each other: if the first provides a competitive price in the labor market, then the second reduces social inequality within the organization.

In the course of research conducted by R.V. Beatty and M. Hueslide [1] found that firms with competent HR management (the so-called "high-performance operating systems") significantly affect profit indicators per employee of average wages, as well as market share in the calculation of one employee. A system for quantifying the efficiency of labor utilization in firms is proposed, the effectiveness of HR management functions and their impact on the general state of labor resources and the level of achievement of strategic goals and the development of HR services are considered. They also identified the main objectives of the HR system or indicators of ultimate performance: mindset, competence, behavior. To achieve high end results, it is necessary in HR to competently perform personnel management functions: communications, organization of workplaces, selection procedure of personnel, and personnel development, staff appraisal, reward system development. Therefore, HR-service should be studied as a personnel management system.

Russian researchers and economists in developed countries were engaged in the adaptation of the grade system to the practice of labor incentives. V.P. Chemekov [3], defined "grading" as a technology for building a personnel management system, and under the grade understood the established range of ranks within which positions are considered equivalent for an economic entity and grouped within a single payment range (tariff). S. Tsymbalyuk [11] revealed a number of advantages of the grade pay system over the tariff system. In their researches S. Slipachuk [9] and a number of other authors proposed a universal methodology for adapting the grade wage system for Russian enterprises of various industries. Sychenko V.V. [10] defined grading as a modern and progressive mechanism of motivational influence and confirmation of professional competence of workers based on the introduction of the principles of transparency and fairness and justified the importance of advanced wage formation methods in modern small and medium enterprises in ensuring the development of this sphere using state regulation mechanisms

O. V. Morshenko [7] in her research highlighted the benefits of the implementation of the grade remuneration system:

- each employee is directly interested in improving the quality of their work;
- successful solution of such anti-crisis measures as optimization of the number of personnel by reducing them;
- transparency, that is obvious why an employee receives less or more than others;

She also noted the disadvantages of the introduction of the grade system:

- requires the implementation of large-scale analytical work aimed at the study of positions and professions;
- with insufficient awareness, the introduction of a grade system may become a demotivating factor if the worker is not sure of his qualifications.

This principle of calculation is as follows:

1. Drawing up a standard questionnaire for all employees of the organization.
2. The distribution of the minimum and maximum wages for each specific position.
3.The calculation of the minimum and maximum points, taking into account the identified factors.
4.The division of the interval of points into several segments, the achievement of which will correspond to a particular class.
5.Determine the amount of payment. For the lowest class, the minimum set of factors guarantees the average market wage for work, for each subsequent level the salary is increased by a certain percentage or amount.

The research of Plenkina V.V. [8] grading is defined as a method for creating a universal hierarchy of positions (ranks) for all company personnel; an assessment system that allows to determine acceptable remuneration levels for all employees based on a comparison of the relative cost of different parts of the work (position) for the company.

In the theoretical and methodological aspect, the development of the regulatory and production method of labor stimulation used the works of Russian scientists from the city of Chelyabinsk: V. N. Belkina, N. A. Belkina [2], recommended by the Russian Academy of Sciences (RAS). They proposed a method of individual and collective labor incentives in the system of labor market evaluation. It involves the stimulation of labor for the goals, results and the formation of a wage fund based on the accounting of the main economic indicators of production and sales of dairy products for the month. The size of the payroll directly depends on the size of the products sold.

MATERIALS AND METHODS

The main objective of this research is to develop an universal algorithm of the regulatory and production method, which includes three blocks: input, process, output. The first block (input) is basic; it allows you to comply with the legislation on the timing of determining the minimum wage, according to article 421 of the Labor Code of the Russian Federation. In the second block (process), the calculation of the base wage grid based on the ranking and its grading system of

remuneration is proposed, which will allow to establish lower-level coefficients more than higher coefficients, taking into account the assessment of workers' qualifications, in three options, depending on the level of enterprise profitability: the 3.5% pitch is equal to 0.4 units, with 7% and 10% - 0.6 and 0.8 units, respectively. In the third block (output), the proposed methodology for the detailed determination of the regulatory and market wage fund will allow to: establish the share of labor costs in the cost of production; justify the criteria and the percentage of each value in the overall indicator and calculate the planned labor efficiency ratio by rating. Thus, the calculation of the coefficient of labor efficiency on the basis of a percentage of the proceeds revealed the market value of labor - its size will be 46,522 rubles per month per employee for dairy enterprises in the region.

The use of the new system, in contrast to the tariff system, has its advantages for both managers and subordinates. Bonus payments and the total wage bill depend on the work of the entire team, taking into account the level of inflation. Remuneration for work is estimated regularly every month, rather than once a year, based on the results of certification. The use of traditional tariff grids takes into account professional characteristics, the level of acquired knowledge, qualifications, but does not take into account the personal contribution of each employee and the entire team to the final result of the work of the entire enterprise and departments, in particular. In market conditions, the remuneration of labor is directly dependent on the volume of marketable products and contracts concluded in order to avoid overstocking of perishable dairy products, and it is also affected by the offer price in the labor market.

In our research, proceeded from the procedural theory of justice D. Adams [5], which is logically linked to the theory of process management, and considers the work process of each employee as a system of inputs – knowledge, skills, motivation, etc., and outputs – salary, bonus payments, social package for career advancement, etc.

General scientific research methods were used: scientific abstraction, inductive, deductive, analysis and synthesis, monographic, statistical and economic, economic and mathematical.

RESULTS AND DISCUSSIONS

As a result of the research, a regulatory and production method of stimulating labor in the processing enterprises of the agro-industrial complex of the region has been developed. It presents a universal algorithm that can be applied at dairy enterprises of the region for various types of products and categories of production personnel and includes three blocks: input, process, output (Table 1).

The first block, "the input", is the basic unit:

1. Primary sources.
2. Regulatory documents:

– compliance with the legislation in terms of art. 421 of Labor Code of the Russian Federation on the procedure and timing for determining the minimum wage provided for in part one of Article 133 of the Labor Code from January 1, 2018 to bring its amount to the minimum subsistence level [6]. Calculation of the tariff scale for workers of processing enterprises of the agro-industrial complex with a low, medium and high level of profitability, as well as at the minimum wage in the Saratov region from 01.05.2018 – 11,163 rubles – base value for employees of organizations in the budget and extrabudgetary sectors [13].

– the application of standard instructions for the maintenance of workplaces developed by research and development institutes and the calculation of prices for products at milk processing enterprises based on the method of designing labor standards, they include two groups: 1) analytical; 2) total. Analytical are based on splitting the normalized process into elements, establishing time by elements and their subsequent synthesis. Total methods establish standards in general for the workflow without preliminary partitioning into elements.

The second block, "process", is a settlement-base unit.

Adaptation of the grade wage system to the tariff schedule [13]: Ranking of inter-qualification ratios based on grading [Table 2].

Table 1. Regulatory and production method of stimulating labor of workers of processing enterprises of the agro-industrial complex of the region based on a systematic approach

Stimulation system of regulatory and production method		
First block. Input, basis	**Second block. Process, basis calculations**	**Calculation of the regulatory market wage fund**
1. Primary sources, searching of new one	2.1. Ranking of inter-qualification ratios on the basis of grading with the value of minimum, average, maximum level of profitability (LP) = 3.5; 7; 10% optimal pitch (gap) between grades – 0.4; 0.6; 0.8, appropriatly	3.1.Calculation of prices for products through the load norms by categories of workers
1.1. Normative documents	2.2. Calculation of the base tariff rate, taking into account the ratio of each category and the level of profitability of the enterprise	3.2. The definition of coefficients of labor participation (CLP) in quantitative measure: minimum = 0.8; average = 1.0; maximum = 1.2
1.1.1.Execution of legislation on the accrual of the minimum wage in accordance with Article 421 of the Labor Code of the Russian Federation	2.3. Grading of employee qualification assessment and relationship with tariffs	3.3 The choice of criteria for the effectiveness of the organization of labor incentives; calculation of the percentage of their performance (PP): PP = Labor efficiency ratio (LER) fact / LER plan * 100%; Size determination through significance ratios (SR): SRincome per 1 worker. = 0.3; SR increase in wages = 0,25; SR capacity. = 0.25; SR capitalization ratio = 0.2
1.1.2. Typical instructions for servicing jobs: - analytical; - total	3.4. Calculation of labor efficiency ratio (LER) using the pyramid model for x = 100% y = x; at x <100%, x> 100% y = 200x-100, where y is the percentage of LER; x - the value of rating performance	
3.5. Determination of the final remuneration of the market value of labor and, on its basis, of the regulatory market wage fund (RMWF): RMWF = ∑HTR*SD.* NSM* NEI *IR*CLP*LER.*12, where: HTR – hourly rate; SD – shift duration; NSM – numbers of shifts per month; NEI – numbers of employees involved; IR – inflation rate; CLP – coefficient of labor participation; LER – Labor efficiency ratio		

Source: developed by authors.

(a)Depending on the financial condition of the enterprise, the step between the highest grade and the previous one is established at the conditional level of profitability prevailing in the dairy processing enterprises of the Saratov region for the main types of dairy products and, in particular, at dairy factory "Volsky Gormolzavod" (Saratov region, Russia): with 3.5% level of profitability equal to 0.4 units; with 7 and 10 % – 0.6 and 0.8 units, respectively.

(b)The range of the minimum and maximum value of the rank of each grade should be greater by 0.2 units than the value of the rank, which is laid in the overlap factor.

Table 2.Ranking of inter-qualification ratios based on the grading of workers of dairy processing enterprises depending on the financial condition, with a low level of profitability*

№	Indicators	Grade number					
		1	2	3	4	5	6
1	Minimum rank value	1.0	1.4	1.8	2.2	2.6	3.0
2	Average rank value. in diapason	1.3	1.7	2.1	2.5	2.9	3.3
3	Maximum rank value	1.6	2.0	2.4	2.8	3.2	3.6
4	Absolute increase	-	0.4	0.4	0.4	0.4	0.4
5	Relative increase.	-	23.5	19.0	16.0	3.8	12.6
6	Width of diapason	0.6	0.6	0.6	0.6	0.6	0.6
7	Overlape	-	0.2	0.2	0.2	0.2	0.2

* step is 0.4; the gap between the minimum, average and maximum values of the coefficients is 0.3
Source: calculated by authors

The type of determining the average values of the rank is set by the options "constant absolute and relative to the previous height" by the average value of the range.
That is, by how many percent the higher grade coefficient is greater than the previous one.
(c)The width of the ranges was calculated as the difference between the maximum and minimum value of the rank. A basic tariff grid unified under the grade wage system has been proposed, where lower-grade coefficients may be greater than higher coefficients, in 3 options, taking into account inter-qualification ratios calculated by ranking and based on the minimum, average, maximum profitability levels. The ratio between the average coefficient of the lowest and the average coefficient of the highest grades is reduced to the solution of the question: how many times should the wage rates of managers and top-level management specialists be greater than the wage rates of employees performing simple work. A small ratio, for example: 1: 2; 1:3 will not take into account in the remuneration system the complexity, working conditions, work experience, responsibility of positions that are included in various grades. In this case, all the work on evaluating the qualifications of workers and determining their value for the enterprise in the grading system, an objective differentiation of wages, will be negated. A ratio of 1:10 can lead to dissatisfaction and social inequality, leading to a decrease in interest in the results of the final work, both of top managers due to both high salaries and workers because of low wages. We consider the optimal variants, depending on the financial condition of the enterprise, the level of profitability of the product range, the ratio between tariff discharges with a minimum level of profitability of 1:4, with an average of 1:6, with a maximum of 1:8 (step 0.4; 0.6 ; 0.8 respectively) (table 3).

Table 3. Calculation of the tariff scale for workers of dairy processing enterprises with a low, medium, high level of profitability*

Ranks	The value of tariff coefficients			Monthly rate			Hourly rate		
	Pitch 0.4	Pitch 0.6	Pitch 0.8	Pitch 0.4	Pitch 0.6	Pitch 0.8	Pitch 0.4	Pitch 0.6	Pitch 0.8
1	1	1	1	11,163	11,163.0	11,163	36.91	36.91	36.91
2	1.3	1.4	1.5	14,511.9	15,628.2	16,744.5	47.99	51.68	55.37
3	1.6	1.8	2	17,860.8	20,093.4	22,326.0	59.06	66.45	73.83
4	1.4	1.6	1.8	15,628.2	17,860.8	20,093.4	51.68	59.06	66.45
5	1.7	2	2.3	18,977.1	22,326.0	25,674.9	62.75	73.83	84.90
6	2	2.4	2.8	22,326.0	26,791.2	31256.4	73.83	88.60	103.36
7	1.8	2.2	2.6	20,093.4	24,558.6	29,023.8	66.45	81.21	95.98
8	2.1	2.6	3.1	23,442.3	29,023.8	34,605.3	77.52	95.98	114.44
9	2.4	3	3.6	26,791.2	33,489.0	40,186.8	88.60	110.74	132.89
10	2.2	2.8	3.4	24,558.6	31,256.4	37,954.2	81.21	103.36	125.51
11	2.5	3.2	3.9	36,279.75	50,010.24	65,303.55	119.97	165.38	215.95
12	2,8	3,6	4.4	50,010.24	72,336.24	98,234.4	165.38	239.21	324.85
13	2.6	3.4	4.2	40,633.32	60,726.72	84,392.28	134.37	200.82	279.08
14	2.9	3.8	4.7	55,033.59	84,838.8	120,672.03	181.99	280.55	399.05
15	3.2	4.2	5.2	71,443.2	11,523.04	162,533.28	236.25	372.10	537.48
16	3	4	5	60,280.2	98,234.4	145,119.0	199.34	324.85	479.89
17	3.3	4.4	5.5	77,359.59	127,704.72	190,329.15	255.82	422.30	629.40
18	3.6	4.8	6	96,448.32	160,747.2	241,120.8	318.94	531.57	797.36

* 3.5; 7; 10 %, respectively.
Source: calculated by the authors on the basis of the State Statistics Service of the Russian Federation.

The third unit – is "output".
The modern market economy, or rather the labor market, can be viewed as a complex and self-regulating system, functioning under the influence of two balancing forces of supply and demand. From this point of view, the equilibrium of the labor market, when the supply of labor is equal to the demand for it, determines the number of employees and the calculation of the regulatory market wage fund [12]

- determination of the indicators of labor participation in the quantitative measure of the assessment of each employee individually in the overall results of work using time-keeping from 0.8 to 1.2 the value of their range;
- calculation of the regulatory market wage fund and the market value of labor, taking into account the coefficient of labor efficiency by rating using the "pyramid" method, which allows to exclude overstocking and non-compliance with the terms of the concluded contracts for the supply of raw materials and sales of finished products [13].

Determination of the final remuneration of the market value of labor and, on its basis, of a regulatory market wage fund.

$$RMWF_i = \sum_{i=1}^{n} HTR \times SD \times NSM \times NEI \times IR \times CLP \times LER \times 12 \quad (1)$$

HTR – hourly tariff rate;
SD – shift duration;
NSM – numbers of shifts per month;
NEI – numbers of employees involved;
IR – inflation rate;
CLP – coefficient of labor participation;
LER – labor efficiency ratio;
n – number of operation

Thus, the essential difference of this methodology is that it can be adapted to the value systems of other organizations using the wage system databases formed within its framework. For this purpose, a wide range of comparative appraisal tools is used to improve the accuracy of the assessment of the market value of labor, as well as its performance.

CONCLUSIONS

A regulatory and production method has been developed to stimulate labor of workers in dairy processing enterprises in the agro-industrial complex of the region, on the basis of which the grade system was adapted to the tariff grid by ranking inter-qualification ratios; in determining the regulatory market wage fund. Unlike other developed methods of remuneration (Belkina, V.N., Slipachuk, S., etc.), this method is distinguished by the joint practical use of tariff and grade systems, as well as the calculation of tariff coefficients based on ranking and charging variable parts the pyramid method. This will allow the calculation of the integral indicator – "labor efficiency ratio".

Testing of the regulatory and production method of labor incentive was conducted on the example of statistical reporting data for the Saratov region as a whole on butter: Form No. 14 of the PR "Report on production, cost and sales of food and processing products for 2016, Form No. 5 "Explanation to the balance sheet and report on financial results", on the basis of which the tariff schedule based on grading was calculated by the author.

The integral indicator of labor efficiency ratio (LER) was 1.22, which is a high estimate of the enterprise's activity for all indicators: income per employee was 5% higher, which is 2 times higher than the inflation rate, which in 2017 was 2.51%. The capital intensity has decreased dramatically, which indicates a positive trend in the development of the enterprise. The increase in labor incentives is possible by improving product quality, increasing turnover. This technique is recommended for implementation in the management practice of milk processing enterprises.

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THE EFFECT OF PLANTS DENSITY AND NITROGEN FERTILIZATION ON THE ECONOMIC EFFICIENCY OF SOYBEAN SEED PRODUCTION IN THE IRRIGATED CONDITIONS OF THE SOUTH OF UKRAINE

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Abstract

The goal of the study was to determine the effect of crop density of middle-ripening soybean variety Sviatogor at different doses of nitrogen fertilizers on the economic and energy efficiency of its cultivation. Results of the study allowed determining that the highest profitability of 237% was provided by the variant with mineral fertilization at the dose of N_{30} with the density of 600 K plants per 1 ha. At the background of mineral nutrition N_{30} and N_{60}, the expenditures per 1 ha decreased by 29.1-28.2%, respectively, in comparison to the unfertilized variants, which led to a significant increase in the net profit. The economic efficiency of growing the middle-ripening soybean variety Sviatogor is significantly reduced at the nutritive background of N_{30} and N_{60}, in comparison to the unfertilized variants, combined with an increase in plant density per hectare from 700 to 1,000 K. The energy coefficient on the fertilized background was higher at the plant density of 600 K plants per 1 ha, and on the unfertilized one - at 500 K plants per 1 ha. We recommend cultivation of soybean variety Sviatogor in the irrigated conditions of the South of Ukraine by the agrotechnological complex with mineral nutrition of N_{30}, plant density of 600 K per 1 ha.

Key words**:** *soybean, irrigation, plants density, nitrogen fertilizers doses, profitability level*

INTRODUCTION

Soybean is one of the most prospective leguminous crops, which is in great demand on the domestic and world markets [21]. On the irrigated lands both of the South of Ukraine and abroad soybean brings agrarians not only positive practical but also valuable economic results, especially, as a highly profitable crop [18]. Its profitability allows returning the costs spent on the cultivation [1, 16].

From the point of view of economic efficiency, soybean provides production of the cheapest plant protein; through the feature of biological fixation of the Nitrogen from the atmosphere it significantly decreases requirements in the application of mineral fertilizers in agriculture; it grants obtaining of environmentally friendly products [2, 4]. However, in recent years prices on fertilizers, fuel, water, pesticides increased and, respectively, the expenditures on cultivation technology raised that is leading to increasing of the seed cost price and the decrease in profitability of production [11, 22]. Therefore, on the modern stage of development of plant science, it is important to enhance soybean production under less expenditure of resources and costs on its cultivation with the purpose of getting the maximum profits from seeds [3, 6, 12].

To achieve the goal scientific and research institutions are constantly trying to improve energy- and resource-saving elements of existent soybean cultivation technologies [7, 13]. The application of such innovative scientific developments will contribute to getting high profits, thereby increasing the volumes of soybean production [5]. That is why the question of study of scientific developments is relevant.

Economic efficiency of new soybean varieties production has been studied insufficiently. The aim of our study was to determine the influence of soybean crops density at the background of different Nitrogen fertilization on economic and energy efficiency of its cultivation.

MATERIALS AND METHODS

The study was conducted during 2016-2018 on the experimental field of the Institute of Irrigated Agriculture of NAAS in the Plant Breeding Department, which is situated in the zone of Southern Steppe of Ukraine, with accordance to common methods of field investigations and methodical recommendations [19].

The experiment is double-factored: factor A – sowing rate (300, 400, 500, 600, 700, 800, 900, 1,000 K seeds per ha); factor B – Nitrogen fertilizer doses (no fertilizer, N_{30}, N_{60}), as in the Table 1.

Table 1.Design of the experiment

Mineral nutrition levels (factor A)	Plants densities (factor B)							
	300	400	500	600	700	800	900	1,000
No fertilizer	1	2	3	4	5	6	7	8
N_{30}	9	10	11	12	13	14	15	16
N_{60}	17	18	19	20	21	22	23	24

Source: Own development of the study design.

Sowing rates were established by taking into account 1,000 seeds weight and sowing suitability. A weight sowing rate of soybean variety Sviatogor at 300, 400, 500, 600, 700, 800, 900, 1,000 K seeds was, correspondingly, – 51, 68, 85, 102, 119, 136, 153, 170 kg per 1 ha. Ammonium nitrate (with 34.6% content of the active substance) was used as a fertilizer. In weight regard the dose of the fertilizer N_{30} equaled to 0.087 tones per 1 ha, N_{60} – 0.170 tones per 1 ha, respectively.

There were four replications with placement of the variants by the method of randomized split plots. The area of sowing plots was 22 m^2, the area, which was taken into account, was 18.5 m^2.

In the researches we used the middle-ripening soybean variety Sviatogor, which had been included into the State Register of Plants Varieties of Ukraine since 2014 and recommended for seminal cultivation in the Steppe zone, were used. The agrotechnology of the middle-ripening soybean variety Sviatogor under the experiment conduction was common for the Steppe zone of Ukraine. The previous crop for this crop was winter wheat. Ammonium nitrate was applied under pre-sowing cultivator tillage with accordance to the study design manually scattering it by the field surface. Sowing was performed by a standard drill SKS-6-10 with wide inter-row spacing of 45 cm on the 2nd of May in 2016, on the 6th of May in 2017, and on the 26th of April in 2018.

Soybean seeds on the day of sowing were treated by the preparation of Nitrogen-fixing bacteria *Bradyrhizobium japonicum 634 b*; protection of the seeds against insects was performed by the treatment with preparation Maxim XL (1 L per 1 ton of the seeds). Soil moisture in the layer of 0-50 cm was maintained at the level of about 70% of the field water-holding capacity. During the period of vegetation there were 7 irrigation performed in 2016, 9 – in 2017, and 8 – in 2018. Irrigation was performed by the means of a machine DDA-100MA with the rates of 40-50 mm.

Weed management was performed by application of the soil herbicide *acetochlor* (2 L per 1 ha) after sowing and rolling of the crops.

Seed yields were determined by the method of entire harvesting of every plot by the breeding self-propelled combine «Sampo-130» with further weighing at the stage of technological ripeness. An average sample of seeds was selected from every plot for further purification and recalculation in the laboratory to the standard moisture of 14% by using the formula:

$$X = A \times (100\text{-}B) / 100 – 14,$$

where:

X is grain yield at 14%-moisture, tones per 1 ha;

A – grain yield without amendment for moisture, tones per 1 ha;
B – grain moisture at the time of harvesting, %.
Energy and economic efficiency of the cultivation technology of soybean depending on the influence of the studied factors was assessed by the method of Martjianov [8].
The researches were carried out on the dark-chestnut middle-loamy slightly solonets soils. The characteristics of weather conditions are provided in the Table 2.

Table 2. Weather conditions in the years of conduction of the experiments for 2016-2018

Month	Year	Air temperature, °C	Precipitation, mm	Relative air humidity, %
April	2016	12.6	56.8	71
	2017	9.3	87.9	72
	2018	14.1	1.6	58
May	2016	16.1	71.7	76
	2017	16.3	25.6	64
	2018	19.5	35.7	59
June	2016	22.1	43.0	68
	2017	22.0	10.3	61
	2018	22.9	23.1	51
July	2016	24.4	46.3	58
	2017	23.4	39.8	60
	2018	24.2	90.8	61
August	2016	24.7	26.7	59
	2017	25.4	1.8	51
	2018	25.5	0.0	46
September	2016	18.0	33.2	63
	2017	19.9	0.7	61
	2018	18.7	42.8	64

Source: The observations and accounting of the weather conditions were performed by Kherson Regional Meteorological Station

The years of the study by the gradation of total evapotranspiration were dry with severe soil and atmospheric drought. That is why soybean cultivation in the South of Ukraine was possible only at performing 8-9 irrigation during the vegetative period. Meteorological conditions during the study were typical for the South of Ukraine.

RESULTS AND DISCUSSIONS

Anthropogenic energy consumption (Ea) for the cultivation of agricultural product included the following points: direct energy consumption (fuel, electricity); energy consumption for production of fertilizers, pesticides, seeds, etc., and energy consumption of productive labor.
As the presented data certify, the higher seed yield is, the higher cost of the cultivated product is (Table 3). At the cultivation of the soybean without application of mineral fertilizers productive expenditures was less in comparison to inclusion of the above-mentioned factor in the agrotechnology.
Production of soybean seed is quite efficient and profitable. In all the variants of the experiment it is provided by the high indexes of net profit and profitability. Conditional net profit was 686-1,898 USD per 1 ha, profitability level – 88-233%.
The elements of cultivation technology and yield have considerable influence on the indexes of economic efficiency of soybean seeds. The maximum share of influence on the index of energy consumption of the technology had agricultural machines – 31.2% and fuels – 25.0% (Table 4).
The less influence had seeds and water – 9.2-15.1%, almost equal share had labor,

pesticides and fertilizers – 5.8-6.5%, and the least influence on the energy consumption had electricity – 1.0%.

On the plots of low resource supply, at non-fertilized background, the maximum profit (1074 USD per 1 ha) was got at the plant density of 500 K per 1 ha.

This variant had the least cost price of 23.8 USD per 1 ton, and the highest level of profitability – 155%, and yields of soybean seeds – 2.94 tons per 1 ha.

Table 3. Economic efficiency of soybean cultivation depending on sowing rates and nutritive background (average for 2016-2018)

Nutritive background	Plants density, K per 1 ha	Conditional net profit, USD per 1 ha	Cost price, USD per 1 tonne	Profitability level, %	Seed yield, tonnes per 1 ha
No fertilizers	300	907	25.4	139	2.60
	400	870	26.4	130	2.56
	500	1,074	23.8	155	2.94
	600	984	25.4	139	2.82
	700	870	27.6	120	2.65
	800	824	28.8	111	2.61
	900	776	30.0	102	2.41
	1,000	686	31.3	88	2.44
N_{30}	300	1,209	22.2	173	3.14
	400	1,202	22.7	168	3.16
	500	1,256	22.5	169	3.29
	600	1,844	18.0	237	4.32
	700	1,475	21.1	188	3.72
	800	1,161	24.5	147	3.39
	900	1,244	24.0	153	3.39
	1,000	1,190	25.0	143	3.33
N_{60}	300	1,423	20.9	191	3.57
	400	1,411	21.3	185	3.58
	500	1,679	19.5	212	4.07
	600	1,898	18.2	233	4.47
	700	1,749	19.6	210	4.25
	800	1,584	21.0	189	3.99
	900	1,935	22.6	168	3.77
	1,000	1,969	23.6	157	3.69

Source: Own calculations with accordance to the results of the experiments

Table 4.Share of energy consumption of soybean cultivation with application of fertilizers dose of N_{30} and sowing rate 600 K seeds per 1 ha

The constituents of the energy consumption	The share, %
Seeds	9.2
Fertilizers	6.5
Fuels	25.0
Electricity	1.0
Pesticides	6.2
Labor	5.8
Water	15.1

Source: Own calculations with accordance to the results of the experiments.

Under an increase of plants density from 600 to 1,000 K plants per 1 ha soybean seed yields decreased (from 2.82 to 2.44 tons per 1 ha) and, respectively, profit (from 984 to 686 USD) and profitability (from 139 to 88%) did so, and cost price of the production increased from 25.4 to 31.3 USD.

Mineral fertilizers significantly increased the seed yield. Both application of N_{30} and N_{60} caused an increase of conditional net profit with changes in the plant density from 300 to 600 K of plants per 1 ha by 52.0% (at the background of N_{30}) and by 33.4% (at the application of N_{60}). Profitability also increased, and cost price decreased.

An increase of the plant density per unit of area all the indexes changed inversely: yields decreased from 3.72 to 3.33 tons per 1 ha at N_{30}, and from 4.25 to 3.69 tons per 1 ha at the background of N_{60}, and conditionally net income by 24.0 (at the background of N_{30}) – 27.8% (at the background of N_{60}), profitability from 188 to 143%, and from 210 to 157%.

The obtained data certify that the variants with plants density of 600 K of plant per 1 ha at the application of fertilizers both in the dose of N_{30} and N_{60} provide almost equal economic efficiency. Notwithstanding the fact that at the plant density of 600 K of plants per 1 ha at the background of N_{60} the highest soybean yield was obtained – 4.47 tons per 1 ha, however, profitability was higher (237%) and cost price of the product lower (18.0 USD) at the application N_{30}. The lowest economic efficiency under the application of fertilizers was at the background of the less dose of N_{30} accompanied by high sowing rate of 1,000 K per 1 ha – conditionally net profit was 1,190 USD. High economic indexes were provided by the plants density of 600 K per 1 ha at the application of N_{30}. At the application of mineral fertilizer in the dose of N_{60} at the plant density of 600 K of plants per 1 ha the expenditures slightly rose up (by 1.2%) and conditional net profit increased by 3% comparatively with the plots where N_{30} was applied. The results of the study show that an increase of Nitrogen fertilizer dose just slightly increased both conditional net profit and soybean yield. That is why it is more efficient to cultivate soybean with application of N_{30} and plants density of 600 K per 1 ha. This provided the least cost price of 18 USD per 1 ha, and the highest profitability of 237%. Efficient energy use allows increasing production at less expenditure. A number of scientists convince that objective assessment of the introduction of new agricultural method is possible only under the conduction of economic and energy analysis that means a comparison not only of money effect but energetic sides of the problem [9, 17, 20].

Energy analysis in agriculture is the assessment of non-renewable energy consumption for crop production and quantity of the obtained with yield energy. The comparative assessment of energy consumption for the studied agrotechnological elements allows using crops cultivation technologies with high yields and the minimum energy resources consumption [15]. These questions are not sufficiently studied for soybean, so, the aim was posed to investigate the energy efficiency of the agrotechnological complex of its cultivation. The index of energy assessment is the energy coefficient (Ke), which is determined as a ratio of obtained with yield energy, to the total amounts of spent anthropogenic energy. A cultivation technology of a crop might be considered as a resource-saving if Ke is more than 1.

To determine the total energy consumption in the variants of the experiment we used its energy equivalents for all means of production, labor resources, fertilizers, fuel, water, seeds, etc., which are presented in scientific works [10, 14].

The total energy consumption per 1 ha of soybean cultivation depending on the variant of the experiment is 33.43-43.74 MJ (Table 5). The least amount of energy was spent in the variants with plants density of 300 K per 1 ha, while thickening of the crops to 900 K per 1 ha increased energy consumption that is explained by high expenses on seed material for sowing with comparatively low yield – 2.77 tons per 1 ha. The total energy consumption was the lowest in the variant

with sowing of 300 K of plants per 1 ha without mineral fertilizers, and at the same variant the least energy amount was accumulated in the yield.

Application of Nitrogen fertilizer significantly increased soybean seed yield whereupon energy consumption of its cultivation raised, amount of the accumulated in the yield energy and energy coefficient increased. The energy coefficient changed directly proportionally with the changes in the yields. At the crop density of 600 K of plants per 1 ha on the non-fertilized background the energy coefficient was 1.39, at the application of N_{30} – 1.91, and under the dose of N_{60} – 1.85. At the background of the same plants density the increase of mineral fertilizers dose increased energy consumption by 6.8% because of high energy content in fertilizers, however, it did not provide a considerable increase in yield and energy accumulation that led to the decrease of the energy coefficient, comparatively with the variants where less fertilizer doses were applied (N_{30}). At the application of N_{30} energy coefficient was 1.42-1.91, and at the dose of N_{60} it was 1.47-1.85.

The higher fertilizer dose was used, the higher total energy consumption was.

The energy coefficient at the fertilized background was higher under the crop density of 600 K plants per 1 ha, and at the non-fertilized – at 500 K plants per 1 ha. At the variant of N_{30} the highest quantity of energy accumulated in the yield (76.42 MJ per 1 ha) was at the plant density of 600 K plants per 1 ha, and this variant provided the best payout of energy consumption (36.32 MJ per 1 ha). An increase of the crop density resulted in a decrease of payout of energy consumption on the both backgrounds of mineral fertilizers. Energy consumption for production of 1 ton of soybean seeds at the plant density of 600 K plants per 1 ha had almost equal indexes at the nutritive background of N_{30} (17,689 MJ), and at the application of N_{60} – 17,691 MJ.

Table 5. Energy efficiency of soybean cultivation depending on the crops density and nutritive background, average for 2016-2018

Nutritive background	Plants density, K per 1 ha	Energy consumption, MJ per 1 ha	Energy income, MJ per 1 ha	Energy coefficient	Energy consumption, MJ per 1 ton of yield
No fertilizers	300	33.43	12.03	1.36	1.30
	400	34.06	10.88	1.32	1.34
	500	34.86	16.62	1.48	1.20
	600	35.43	13.92	1.39	1.27
	700	35.99	10.54	1.29	1.37
	800	36.56	9.08	1.25	1.42
	900	37.17	7.58	1.20	1.47
	1,000	37.74	4.89	1.13	1.57
N_{30}	300	36.47	19.08	1.52	1.16
	400	37.12	18.78	1.51	1.17
	500	38.34	19.86	1.52	1.17
	600	40.10	36.32	1.91	0.93
	700	39.85	25.96	1.65	1.07
	800	39.63	17.16	1.43	1.23
	900	40.91	19.06	1.47	1.21
	1,000	41.52	17.39	1.42	1.25
N_{60}	300	39.87	23.28	1.58	1.12
	400	40.52	22.81	1.56	1.13
	500	41.95	30.05	1.72	1.03
	600	42.81	36.27	1.85	0.96
	700	43.33	31.86	1.74	1.02
	800	43.22	27.36	1.63	1.08
	900	43.74	22.95	1.52	1.16
	1,000	44.34	20.94	1.47	1.20

Source: Own calculations with accordance to the results of the experiments.

CONCLUSIONS

The conditional net profit of 1,844 USD per 1 ha, the highest profitability of 237%, and the lowest expenditures per 1 ha of 18 USD were provided at the variant with N_{30} and 600 K plants per 1 ha.

Mineral fertilizer dose of N_{60} at 600 K plants per 1 ha increased the expenditures by 1.2%, and this resulted in the increase of the net profit by 3%, comparatively to the variants with N_{30}.

600 K plants per 1 ha at the fertilization both in the dose of N_{30} and N_{60} provided the equal economic efficiency. Mineral nutrition both of N_{30} and N_{60} caused a considerable increase of the net profit.

The economic efficiency of the soybean cultivation decreased at the fertilizers background of N_{30} and N_{60} in a combination with the increase of the plant density from 700 to 1,000 K. The energy coefficient at the fertilized background was higher at the crop density of 600 K, and at the unfertilized – at 500 K plants per 1 ha.

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SOCIAL CAPITAL EFFECTIVENESS TOWARD COMPETITIVE ADVANTAGE AND BUSINESS PERFORMANCE (CASE STUDY OF VILLAGE CREDIT INSTITUTIONS IN GIANYAR REGENCY, BALI, INDONESIA)

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Abstract

One of the institutional uniqueness in Bali is the existence of custom villages. The Provincial Government of Bali has not been able to take operational funding policies to the level of traditional villages, so there are still many village potentials that still need to be explored and developed for the welfare of the community. To realize this, the Bali Provincial Government triggered the establishment of a Village Credit Institution (LPD) in all traditional villages in Bali. LPD is part of village assets that have the potential to improve the people's economy. This research was conducted to analyze: (1) the effect of social capital on competitive advantage and business performance of LPD; (2) the effect of competitive advantage on business performance of LPD; and (3) the role of competitive advantage as mediator between social capital and business performance of LPD in Gianyar Regency. The population in this study were all LPDs in Gianyar Regency, with a sample of 73 LPD managers, of which respondents were determined by proportional stratified random sampling technique. The data collection technique was done by questionnaire instrument, and continued with SEM-PLS analysis. The results show that social capital has a positive and significant effect on competitive advantage and also on LPD's business performance. Competitive advantage also has a positive and significant effect on LPD's business performance. On the other side, competitive advantage also as significant mediator between social capital and LPD's business performance in Gianyar Regency.

Key words**:** *social capital, competitive advantage, business performance, village credit institution (LPD)*

INTRODUCTION

Bali is one of the provinces in Indonesia which is famous for its tourism, culture and customs. One of the institutional uniqueness in Bali is the existence of traditional villages or also called traditional villages. The Provincial Government of Bali has not been able to take operational funding policies to the level of custom village, so there are still many village potentials that still need to be explored and developed for the welfare of the community. The Bali Provincial Government realizes that the government needs to support the village to provide institutions that are appropriate to the needs and acceptable to rural communities. Therefore, in 1984 the Provincial Government of Bali established a regulation to establish LPDs in traditional villages in Bali. Village Credit Institutions (LPD) are one of the non-bank financial institutions in rural areas, where LPDs have a very large contribution in helping community businesses in a rural area, especially rural communities in Bali which are often referred to as custom villages.

LPDs are financial institutions belonging to traditional villages, therefore LPDs are part of village assets that have the potential to improve the people's economy. This institution is engaged in finance which functions as a collector and distributor of funds in the form of savings and time deposits which will later be circulated back through credit to the local community.

The LPD encourages economic development of the community by participating and raising funds or savings from custom village members. In addition, the presence of LPDs is expected to be a financial institution that

provides credit for custom village members, so that they are free from loans to those who provide high-interest loans. Another goals of making LPDs is to create business opportunities and employment opportunities for custom village members, and by itself the LPD will be able to support the improving and facilitating the circulation of money in custom villages.

The legal position of the LPD cannot be equated with BPRs, MFIs, and Cooperatives. The LPD's constitutional foundation is different from BPR, MFIs, and Cooperatives, as well as its legal basis [20]. Factors supporting the success of the LPD as a people's economic institution based on customary law communities in Bali, depend on the quality of human resources, namely the moral and desire to progress, followed by HR members of traditional villages who always support LPD programs.

Based on data from the LPD Supervisory Agency (LPLPD), it is known that the number of LPDs in Bali in 2017 was 1,433 LPDs, almost 71.3 percent were declared healthy, while the remaining 28.7 percent were stated to be healthy, unhealthy and stuck. The comparison shows that the percentage of LPDs that are underperforming is still quite high and this indicates that there are LPD constraints in optimizing their performance.

The health condition of LPDs in Gianyar is still low, as indicated by the average of Non Performing Loan (NPL) value of 12.99 percent at the end of 2017. The NPL value is 12.99 percent far above the required value for financial institutions' health at 5 percent. If these conditions are not addressed immediately, it will certainly have an impact on the competitiveness and development of the LPD business.

The results of a preliminary survey conducted on several LPD managers in the Gianyar Regency area revealed several problems often faced by LPDs so that they were unable to compete with other bank and non-bank financial institutions including: (1) Regeneration constraints and the age limit of LPD managers; (2) low innovation in business development; (3) there is no guarantee institution for customer deposits; (4) lack of manager's understanding of technological developments to market products and services; (5) community ownership of LPDs is still lacking; (6) public trust in LPDs is still low; (7) networks between institutions and between communities are still low; (8) rules or norms are mostly still conversion and binding into. This obstacle is an indicator, that the LPD does not have competitiveness in the community of custom village.

Social capital was important to the business performance [30][31]. Social capital with a dimension of trust induces a shared vision among business people. Trust is a prerequisite for long-term cooperation and sharing a common goal and vision, so that when you have the same vision between the LPD manager and the community, it can improve business performance. Social capital to build network relationships with company partners emerged as important in achieving competitive advantage [19]. Business performance will increase, if the company has a competitive advantage so that it can compete with competitors. Competitive advantages in terms of cost, quality, kites, innovation and uniqueness of the company will be able to improve the company's business performance [2][11][13].

This research was conducted to analyze: (1) the effect of social capital on competitive advantage and business performance of LPD; (2) the effect of competitive advantage on business performance of LPD; and (3) the role of competitive advantage as mediator between social capital and business performance of LPD in Gianyar Regency.

MATERIALS AND METHODS

The concept of competitive advantage

There are two models that complement each other's competitive advantages. The first model focuses on costs and differentiation and argues that the environment selects companies that are not efficient going out or market-based companies but do not offer products that consumers are willing to pay premium prices. The second model focuses on company

resources and is driven by factors that are internal to the company.

Competitive advantage also mean to maintain the position over its competitor, because it is the view of market-based come from superior cost structure to differentiate in ways which is provide to customer an added value [11][15]. It consists of capabilities that allow an organization to distinguish itself from its competitors and is the result of critical management decisions [9]. The construction dimensions of competitive advantage used in this study are price/cost, dependency delivery, product innovation, and time to market [2]. Competitive advantage is measured by dimensions [10]:

(i)cost-based benefits (two items: lower production costs and lower-priced products);

(ii)product-based profits (six items: product differentiation, packaging, design, style, product quality and accessibility);

(iii)service-based excellence (seven items: extensive product line, reliability, flexibility, product innovation, speed of delivery, technical support and value for customers).

Competitive advantage is more advantage gained from competitors by offering consumers greater value, either by lower prices or by providing products that provide greater consumer benefits and services that justify higher prices [15]. The idea of creating value provides an insight into the source of competitive advantage. Value creation has three aspects: benefits received by customers, costs incurred by the company and its suppliers, and certain combinations of customers and suppliers. Because the total value created by the company also equals the customer's willingness to pay minus the costs of using company assets and costs incurred by suppliers, achieving competitive advantage means that the company must either increase customer benefits, lower supplier costs, or find innovative transactions.

Thus, there are three sources of competitive advantage:

-Cost Efficiency that makes more efficient use of company assets and input suppliers or lower supplier costs;

-Product differentiation to increase customer profits; and

-Transaction Innovations that reduce transaction costs or create new combinations of customers and suppliers.

Companies able to produce products/services with lower costs compared to competitors is one way for competitive advantage [15]. This is often achieved by large-scale organizations that develop efficiency by reasoning with their repeated experience of the tasks involved or using their power to exploit lower costs. Two other sources Competitive advantage comes from the value seen by customers who either see certain interesting elements in supply (differentiation) or feel that all their needs are met in the best way by bidding on the competitor (focus) When market demand outruns industrial capacity, competitive advantage increases added value by the company and also increases its potential profits. When industrial capacity outruns market demand, competitive advantage also ensures that the company will survive [15].

Organizational performance

Research has shown a significant relationship between competitive advantage and business performance [7] [10] [12]. Companies that have competitive advantages can improve business performance, because companies are unique and not easily imitated by competitors. An effective performance measurement system must be achieved not only financial aspects of business performance but also non-financial elements, thus presenting clearer perceptions and dimensions and broader performance [10].

In this study business performance is assessed based on various perspectives including based on finance, customers, employee performance, and internal business. From several previous studies, we know that there was a significant relationship between competitive advantage and organizational sales-based performance. It's also declared that sales-based performance was measured by the level of sales revenue, profitability, return on investment, productivity, product value added, market share and product growth [10][27][14]. In addition, organizational-

based performance is measured with an emphasis on organizational internal process efficiency, customer satisfaction, employee development and job satisfaction [27][14].

Social capital

Social capital is information, trust, and norms of reciprocity inherent in social networks [26]. Social capital refers to the characteristics of social organizations such as networks, norms, and beliefs that facilitate mutual coordination and cooperation. Social capital also adds subjective elements, cultural processes such as mutual trust and norms that facilitate social action. This difference shows a reciprocal relationship between social capital, community social organizations, and social networks. Social networks and community social organizations provide resources that can be used to facilitate action. Social capital in turn produces further resources that contribute to community social organizations and social network resources.

Social capital is a series of processes of human relations that are supported by networks, norms, and social beliefs that enable efficient and effective coordination and cooperation for mutual benefits and virtues [4]. Social capital is the appearance of social organizations such as trust, respiration, networks that can improve community efficiency by facilitating coordination of cooperation for mutual benefit [17]. The parameters of social capital can be grouped into three, namely network, trust, and norms [21].

Social capital is a productive resource that can be enjoyed by organizations or individuals as long as there is a relationship, but disappears when the relationship no longer exists [32]. Many entrepreneurs are successful because of innovation, but so far many entrepreneurs have not realized that their ability to do business and the ability to innovate are inseparable from the social factors around them, whether from family members, the environment, school environment, colleagues, network performance in business, encouraging family, friends, and colleagues in business [25]. These social factors can be interpreted as social capital in business. The results of previous studies found that social capital both internal and external has a positive effect on organizational performance [18].

Conceptual framework and hypothesis

Based on the description above, a conceptual framework can be drawn from this research, which is as Figure 1.

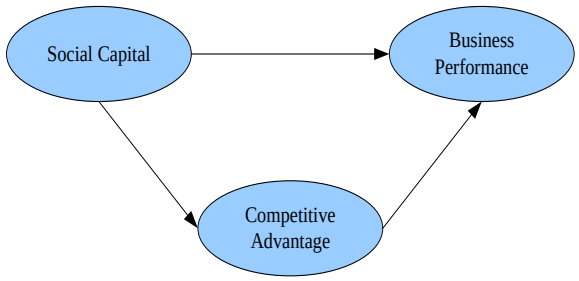

Fig. 1. Conceptual Framework
Source: Own extracted from theory, concept, and previous research.

Based on the formulation of the problem and the theoretical basis can be formulated hypotheses as follows:

H_1:The better social capital, the more competitive advantage will be increased significantly.

H_2:The better social capital, the more business performance will be increased significantly.

H_3:The better competitive advantage, the more business performance will be increased significantly.

H_4:Competitive advantage mediates the effect of social capital on business performance significantly.

Research method

This research was conducted at the Village Credit Institution (LPD) in Gianyar Regency, Bali. The research subjects were managers of LPDs in Gianyar Regency. Consideration of choosing LPDs in Gianyar Regency as the location of the study, with reasons for several reasons: (1) The level of health of LPDs in Gianyar Regency is still low, where NPLs are 13 percent, which means it is still above the healthy NPL standard of 5 percent; (2) The characteristics of the people in the Gianyar Regency region are relatively unique compared to other regions because the ties of adat and culture are still closely related to the community.

This research uses primary data types, by collecting data from LPD managers in Gianyar Regency. The population in this study were all LPDs in Gianyar Regency, where based on data from the Gianyar Regency LPLPD in 2018 there were 270 LPDs. Samples were taken based on population, where the determination of the number of samples used the Slovin formula [22] to obtain a sample of 73 LPDs. Samples taken using method, *probability sampling* namely *proportional stratified random sampling* based on sub-district strata.

This study uses a questionnaire that has been proposed validity and reliability as a research instrument. In addition, the questionnaire was also compiled based on the results of several previous research.

As show in Figure 1, the model in this research is built from latent with its reflective indicators which are quite complex, data analysis will use the discussion of Structural Equation Modeling (SEM) - Partial Least Square (PLS) that based on components or variants. PLS is an alternative approach to the shift from a covariant SEM-based approach to a variance-based [6]. explained that the difference between PLS and SEM lies in the purpose of its use, covariance-based SEM is generally to test a theory or causality relationship, while PLS tends to be more predictive of a model.

RESULTS AND DISCUSSIONS

General description of LPD in Gianyar

Regency Gianyar Regency has the highest number of LPD after Tabanan Regency. The development of LPDs in Gianyar Regency is not immune from several problems, including the difference in the amount of LPD asset growth where some LPDs have large amounts of assets and others have relatively few assets, besides the capital adequacy of several LPDs has not been fulfilled.

Based on Table 1, it can be seen the highest total assets owned by LPD Subdistrict of Ubud amounting to Rp1,108,053,382 and the lowest is owned by Payangan District of Rp147,051,272 while the highest net income is owned by Ubud District of Rp32,334,032 and the lowest was the District of Tampaksiring in the amount of Rp.4,606,884.

Table 1. Net Profit, Total Assets, and *Return On Asset* of LPD in Gianyar Regency by District Year 2016

District	Net Profit (Million IDR)	Total Assets (Million IDR)	ROA (%)
Blahbatuh	10.574	379.401	2.79
Gianyar	16.250	360.844	4.50
Payangan	4.688	147.051	3.19
Sukawati	25.465	596.176	4.27
Tampaksiring	4.606	203.160	2.27
Tegallalang	9.268	491.434	1.89
Ubud	32.334	1,108.053	2.92
Total	103.188	3,286.120	3.14

Source: LPLPD Gianyar Regency, 2018.

The importance of the role of the LPD to improve the economy of indigenous villagers therefore the LPD needs to get the attention of indigenous villagers.

The concern is that LPDs cannot be separated from the LPD's ability to make a profit, which is a company performance indicator [16]. A good LPD performance can lead to increased profits or profits.

Results of Data Analysis

Data analysis stage with the SEM-PLS technique was carried out through two stages. In the first stage an evaluation of the carried out outer model is by evaluating the validity and reliability between each indicator and its construct.

Then the structural model or tested inner model is to evaluate the influence between constructs or between research variables.

Evaluation of outer model

An indicator can be said to be valid *(convergent validity)* if it has a *factor loading* and AVE above 0.5 against the intended construct.

Table 2. shows that there is one indicator that has an outer loading value below 0.5 which is a growth and learning performance indicator (Z4) in the construct or business performance variable (Z).

This shows that growth and learning performance indicators (Z4) must be eliminated from the research model.

After an invalid indicator is eliminated, the next step needs to be retested. The test results are in the form of output as in Table 3.

Table 2. Test Results for Validity of Convergent

Outputs	Indicators	Construct		
		X	Y	Z
Outer Loading	X1	0.697		
	X2	0.638		
	X3	0.820		
	Y1		0.758	
	Y2		0.507	
	Y3		0.693	
	Y4		0.570	
	Z1			0.776
	Z2			0.670
	Z3			0.660
	Z4			*0.401*
AVE		0.522	0.509	0.402

Note: X=social capital, X1=trust, X2=norm, X3=network, Y=competitive advantage, Y1=cost efficiency, Y2=product quality and services, Y3=innovations and R&D, Y4=competitor orientation, Z=business performance, Z1=performance of social mission, Z2=financial performance, Z3=internal business performance, Z4=growth and learning performance

Source: Output of data from questionnaire that analyze with Smart-PLS application.

Table 3. Convergent Validity Test Results Stage Two

Outputs	Indicators	Construct		
		X	Y	Z
Outer Loading	X1	0.686		
	X2	0.639		
	X3	0.826		
	Y1		0.771	
	Y2		0.509	
	Y3		0.650	
	Y4		0.600	
	Z1			0.822
	Z2			0.662
	Z3			0.672
AVE		0.521	0.509	0.522

Note: X=social capital, X1=trust, X2=norm, X3=network, Y=competitive advantage, Y1=cost efficiency, Y2=product quality and services, Y3=innovations and R&D, Y4=competitor orientation, Z=business performance, Z1=performance of social mission, Z2=financial performance, Z3=internal business performance

Source: Output of data from questionnaire that analyze with Smart-PLS application.

The results of the validity test show that all research indicators have outer loading above 0.5 and the value of Average Variance Extracted (AVE) greater than 0.5, it can be said that all research indicators are valid as they appear in Table 3.

Measuring discriminant validity from the measurement model can be assessed based on cross-loading measurement indicators with the construct.

Table 4 shows a comparison between the indicator correlation of a construct and the correlation of the indicator with other constructs.

Table 4. Results of Discriminant Validity

Indicators	Construct		
	X	Y	Z
X1	*0.686*	0.286	0.216
X2	*0.639*	0.174	0.300
X3	*0.826*	0.250	0.487
Y1	0.295	*0.771*	0,407
Y2	0.010	*0.509*	0.183
Y3	0.301	*0.650*	0.288
Y4	0.109	*0.600*	0.393
Z1	0.386	0.478	*0.822*
Z2	0.358	0.293	*0.662*
Z3	0.318	0.336	*0.672*

Note: X=social capital, X1=trust, X2=norm, X3=network, Y=competitive advantage, Y1=cost efficiency, Y2=product quality and services, Y3=innovations and R&D, Y4=competitor orientation, Z=business performance, Z1=performance of social mission, Z2=financial performance, Z3=internal business performance

Source: Output of data from questionnaire that analyze with Smart-PLS application.

Table 4 shows that construct indicator correlation has a higher value than the correlation of the indicator with other constructs, so the construct has high discriminant validity. The value of Cronbach's Alpha measures the lower limit of the reliability value of a construct, and Composite Reliability measures the true value of the reliability of a construct [23]. The Role of thumb of the value of Cronbach's Alpha or Composite Reliability must be greater than 0.7, but if the results obtained are close to 0.7 (such as 0.6), this can still be accepted in studies that are exploratory in nature [8]. The results of the construct reliability test can be seen in Table 5.

Table 5. Value Cronbach's Alpha and Composite Reliability

Construct	Cronbach's Alpha	Composite Reliability
Social Capital (X)	0.868	0.893
Competitive Advantage (Y)	0.606	0.786
Business Performance (Z)	0.791	0.862

Source: Output of data from questionnaire that analyze with Smart-PLS application.

Values in Table 5. shows the value of Cronbach's Alpha and Composite Reliability of each construct has a value greater than 0.60

so it can be said that the measurement used in this study is reliable.

Evaluation of inner/structural model

The structural model in PLS needs to be evaluated using the R-square for the dependent variable and its significance value based on the t-values in each path.

Table 6. Value of R-square

Endogenous Variable	*R-square*
Competitive Advantage (Y)	0.106
Business Performance (Z)	0.387

Source: Output of data from. questionnaire that analyze with Smart-PLS application

Values in Table 6 shows the R-square 0.106 to construct a competitive advantage, which means that the variability construct competitive advantage can be explained by the social capital construct is 10.6%, and the remaining 89.4% is explained by factors other than social capital. Furthermore, it is also known that the *R-square* value of 0.387 over the construct of business performance shows that business performance variability can be explained by the construct of social capital and competitive advantage by 38.7%, while the remaining 61.3% is explained by other factors outside the model.

R-square is grouped into three categories, namely substantial (> 0.67), moderate (0.19 - 0.67), and weak (<0.19) [3]. So that the *R*-square value for the competitive advantage variable is included in the weak category, while the R-square value for the business performance variable includes the moderate category. Based on R^2 in Table 6, Q^2 can be calculated or Stone Geiser Q-Square, namely:

$Q^2 = 1 - \{(1 - 0.106)(1 - 0.387)\}$

$= 1 - \{(0.894)(0.613)\}$

$= 0.452$

The results of Q^2 calculation are 0.452 so that it can be said to have predictive prevalence a fairly strong, so that the resulting model deserves to be used to predict. Figures of 0.452 can be interpreted that variations in LPD business performance by 45.2% can be explained by variations in variables of social capital and competitive advantage, while the remaining 54.8% is explained by other variables outside the model.

Hypothesis testing

To test hypotheses, it is necessary to analyse the direct influence, indirect influence, and total influence between the research variables. The results of the analysis related to the influence between research variables are presented in Table 7.

Table 7. Path Coefficient

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
X → Y	0.325	0.358	0.114	2.850	0.005
X → Z	0.358	0.359	0.104	3.434	0.001
Y → Z	0.405	0.415	0.117	3.451	0.001

Note: X=social capital, Y=competitive advantage, Z=business performance

Source: Output of data from questionnaire that analyze with Smart-PLS application.

As the research conceptual framework, that there is an indirect relationship between variables of social capital and business performance through competitive advantage, then Table 8 shows an analysis of indirect effects.

Table 8. Indirect Effect

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
X→Y→Z	0.132	0.144	0.057	2.310	0.021

Note: X=social capital, Y=competitive advantage, Z=business performance

Source: Output of data from questionnaire that analyze with Smart-PLS application.

Based on Table 7 and Table 8 can be summarized and calculated direct influence, indirect influence, and total influence between research variables as presented in Table 9 below.

Table 9. Summary of Direct Effects, Indirect Effects, and Total Effect Among Variables

Exogenous Construct	Endogenous Constructs					
	Y			Z		
	DE	IDE	TE	DE	IDE	TE
X	0.325	-	0.325	0.358	0.132	0.490
Y	-	-	-	0.405	-	0.405

Note: DE=Direct Effect, IDE=Indirect Effect, TE=Total Effect, X=social capital, Y=competitive advantage, Z=business performance

Source: Output of data from questionnaire that analyze with Smart-PLS application.

Based on the results of data analysis, it can be summarized the direct influence, indirect influence, and total influence between variables chosen as results.

Table 10. Results of Hypothesis Testing

Hypo-thesis	Description	Results
H1:	The better social capital, the more competitive advantage will be increased significantly.	Accepted
H2:	The better social capital, the more business performance will be increased significantly.	Accepted
H3:	The better competitive advantage, the more business performance will be increased significantly.	Accepted
H4:	Competitive advantage mediates the effect of social capital on business performance significantly.	Received

Source: Own Analysis.

Data analysis results show that social capital has a positive and significant effect on excellence competing LPDs in Gianyar Regency. This means that the higher the social capital the LPD has, the higher the competitive advantage that the LPD has, and vice versa.

The trust of the people in Gianyar Regency continues to spur LPDs in Gianyar Regency to innovate in providing quality financial services according to community needs. LPDs in Gianyar Regency have been able to compete with other microfinance institutions that have also begun to develop. Even the LPD not only provides savings and loan services to the community, but also in the form of insurance, and deposits for special purposes, such as education and religious ceremonies.

The results of previous studies of the LPD in Buleleng Regency, indicate that the operating strategy contained in LPD's organizational culture adopted by the values of Tri Hita Karana [29]. *Tri Hita Karana* is a philosophy that has been considered as a norm and/or belief that regulates the relationship between humans and God, humans and fellow humans, and humans and the environment. This is shown from the results of hypothesis testing that the organizational culture based on *Tri Hita Karana* has a significant effect on LPD operating strategies. This result is consistent with other studies which state that organizational culture plays a role in the process of formulating operational strategies as the operationalization of underlying values and assumptions [5]. The operating strategy formulated by LPD administrators in Buleleng Regency tends to be directed at developing facilities for service improvement and product development, where service and product quality are tangible forms of competitive advantage.

The results of data analysis showing significant social capital have a positive impact on LPD business performance in Gianyar Regency. With regard to social capital that will help create good business too, on the contrary choose bad social capital, the LPD business performance in Gianyar Regency also decreases.

LPDs in Gianyar Regency tend to still be highly trusted by member of custom village, as well as stakeholders related. Many member of custom village use financial services provided by the LPD. In addition, LPDs are also trusted by other institutions, such as PT. Bank BPD Bali related to capital. Even some LPDs have collaborated with outside parties such as the PDAM, PLN, and other government institutions including the LPLPD. This shows that the network built by the LPD is growing.

Social capital has had a positive impact on LPD business performance. It is evident that many LPDs in Gianyar Regency have been able to provide substantial financial assistance to traditional customary activities *village*. This certainly happened as a result of the LPD's financial performance success. Own financial performance is of course also for the participation of the local community.

The results of previous studies regarding the inclusion of social capital in the LPD Internal Control Structure of the Penglatan traditional village, Buleleng District, Buleleng Regency, explained that the LPD Penglatan had not been able to implement a disciplined internal control structure to improve its business performance [1]. But this indiscipline does not cause problems for LPDs, even the LPDs continue to develop. This success is due to the LPD incorporating social capital in its internal control structure.

It was also explained that social capital turned out to have a positive and significant effect on

the existence of LPDs. This indicates that the better the social capital, the existence of LPD is also getting better or more existing [24].

The results of data analysis show that competitive advantage has a positive and significant effect on LPD business performance in Gianyar Regency. This means that the better LPD competitive advantage will have an impact on improving LPD business performance, and vice versa.

Competitive advantage is an important element for a business. Likewise the LPD as an organization *profit oriented*, which despite its socio-cultural nature. This means that in order to optimize its performance, both financial and non-financial performance, LPDs must be able to provide products and services according to the needs of the community, as well as make efficiency. In addition, LPDs also need to innovate so that they are not left behind by competitors, in this case other microfinance institutions.

In the empirical study of LPD in Rendang Subdistrict Karangasem Regency, that the relationship between operating efficiency on profitability in Village Credit Institutions (LPD) in Rendang Subdistrict, Karangasem Regency based on statistical test results, can be interpreted that if the value of operating efficiency is high, the profitability of LPD will be lower. On the other side, if the value of operating efficiency is low, then the profitability of LPD will be higher [28]. It's caused by the increased in operational costs in Village Credit Institutions (LPD) in all Rendang Districts, Karangasem Regency will have an impact on decreasing profitability. Increase in operational costs because LPD operational activities are less efficient, so the BOPO ratio is also very high. The higher the low BOPO ratio, the better the LPD and operational activities will be more efficient, so the operating profit will increase.

Competitive advantage proved to be able to significantly mediate the influence of social capital on LPD business performance in Gianyar Regency. This means that in order for social capital to be optimal in improving LPD performance, it can be done by optimizing the role of competitive advantage as a mediator. Given that directly or indirectly by mediating competitive advantage, that social capital turns out to have a significant effect on business performance, then this indirect effect is *partial mediation* (partial mediation).

These results indicate that the social capital shown by *trust, norms,* and the *network* LPD plays an important role in LPD business performance, both in its social mission, internal business performance, and financial performance.

CONCLUSIONS

The results show that social capital has a positive and significant effect on competitive advantage and also on LPD's business performance. Competitive advantage also has a positive and significant effect on LPD's business performance. On the other side, competitive advantage also as significant mediator between social capital and LPD's business performance in Gianyar Regency.

There are several things that can be suggested as a follow-up to the results of the study, including:

(i)In its operational activities, LPDs in Gianyar Regency need to implement a component of the internal control structure in a disciplined manner. One of them is by utilizing social capital to strengthen the LPD internal control structure, namely through *trust* (mutual trust), social networks, and social institutions;

(ii)LPDs in Gianyar Regency can utilize the social capital they have for the efficiency and effectiveness of LPDs, one of which is by reducing transaction costs;

(iii)Further researchers can develop this research model to be more complex, by adding other variables, and expanding the scope of the study.

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BALANCED SYSTEM OF ECONOMIC PERFORMANCES AS A STRATEGY-FORMING TOOL OF DEVELOPMENT OF AGRICULTURAL ENTERPRISES IN UKRAINE

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Abstract

A strategy is a long-term mark of enterprises' activities that directs its efforts at obtaining higher results compared to its competitors. The article displays the results of conducted sociological investigation of application tendencies of different tools of strategic planning in practical activities of agricultural enterprises. This served as the basis of defining main problems of strategic planning management and the perspectives of its development. The authors improved the strategic planning management methodology on the basis of application balanced system of economic performances by taking into account the efficiency of the use of land, financial, labor and material and technical resources. The criterion scale of evaluating strategic planning ability of agricultural enterprises has been designed. The obtained investigation results serve as the basis for selection of strategic planning analysis tools and methods of strategy construction of agricultural enterprises development.

Key words**:** *strategy, strategic planning analysis, agricultural enterprise, balanced system, economic performanc*

INTRODUCTION

In conditions of rapid economic development it is more difficult for leaders of agricultural enterprises to obtain competitive advantages only at the cost of efficient financial management and sufficient level of investments into fixed assets. Besides, excessive concentration of managers on short-term financial results and current problem-solving leads to insufficient financing of long-term projects potential value engineering. The important place here is occupied by strategic planning and the design of efficient business plan. An agricultural enterprise should find new optimal methods of activities management with the purpose of adapting to future external factors that are changing constantly. A strategy is a long-term landmark of the activities of an enterprise which directs its efforts at achieving higher results compared to its competitors.

Home and foreign scholars state that any agricultural enterprise needs provision of stable economic growth in long-term perspective. That is why it becomes more necessary to perform strategic planning and economical activities management cannot be limited just by approval of tactical management decisions.

Blank I. says that "at present stage the greater number of enterprises realizes the necessity of strategic planning management of economic activities on the basis of scientific methodology of forecast its directions and forms, adaptation to external aims of enterprise development and the demands of changing external environment" [5].

The divisional manager of agriculture and land reform of European Commission Enzo Damiani thinks that "a strategy is acting road map of reforming agricultural sector in Ukraine combining the combination of mutual vision of branch modernization with short- and medium-term plans and also a set of everyday tasks for ministry" [21].

Michael Boehlje, Allan Gray and Craig Dobbins state that successful farmers of XXI century are not highly qualified production managers but they also should know how to position their businesses in order to achieve long-term perspective. The strategy consists

in making choices; defining what draws the attention of farm enterprise manager and where he concentrates his recourses [6].

Don Hofstrand states, that "the purpose of the strategic planning process is to design a farm business that allows the individuals involved in the business to achieve their personal goals" [11].

At present, the methodology of strategic planning is developing quite actively. In modern science there are many scientific approaches to the development of strategic plans [1; 6; 8; 11; 12].

Summarizing the results of our previous research on the specifics of the planning system at agricultural enterprises [22; 23], as well as analyzing the current trends of strategic planning in other countries [17; 18; 19], we proposed an improved methodology of strategic planning for agricultural enterprises based on a balanced system of indicators

Strategic planning and the design of the strategy of agricultural enterprises development depends on internal economic factors that emerge from the environment of an enterprise and are under its influence. If the management of an enterprise uses its internal resources effectively it influences strategic orientation and critical foresight of an enterprise.

MATERIALS AND METHODS

In this research, the following general scientific and specific methods were used: sociological research – to determine the level of development of the strategic planning system in the existing agricultural enterprises; comparison method – to determine the effectiveness of applying different methods of strategic planning; calculation and analytical method – to develop a balanced system of indicators; generalization – to systematize various scientific approaches to the process of strategic planning.

Taking into account the fact that the results of the research showed that the system of strategic planning is poorly developed at the existing agricultural enterprises of Ukraine. In connection with this, we have developed a methodology for strategic planning based on a system of balanced indicators.

The methodology of balanced system of economic performances design

Every agricultural enterprise has different possibilities for forming and implementation of development strategies on the basis of economic efficiency. As it has been mentioned before the development strategy design of agricultural enterprises is influenced internal economic efficiency performances, such as:

1) the use of land resources;
2) the use of financial resources;
3) the use of labor resources;
4) the use of material and technical resources.

In order to define strategic capacities of an agricultural enterprise we will build balanced system of economic performances that influence its activities. This system is necessary for tool choice for strategic analysis and strategy design.

Table 1. Key indices of balanced system of economic performances

Sphere	Index name	Statutory index meaning
The use of land resources	Gross production for 100 ha of land, El.	increase
The use of financial resources	Absolute liquidity ratio, Rabs.l.	more than 0.1
	Liquidity coverage ratio, Rcov.l.	more than 1
	Long-term attracting of loans ratio, Rl.l.	less than 1
	Return on equity (ROE), Roe.	not less than 1 %
	Return on assets ratio (ROA), Rass.	optimally 10-20 %
The use of labor resources	Labor productivity, Lpr.	increase
	Return on labor (ROL), Rol.	increase
	Rate of turnover ratio, Rto.	decrease
The use of material and technical resources	Working capital ratio, Rwc.	increase
	Inventory turnover ratio, Rti.	3-6
	Profitability of stocks, Ps.	increase

Source: proprietary design of the authors.

The implementation of balanced system of

economic performances as a new management method makes it possible to solve present economic problems of every agricultural enterprise and also to shape and implement optimal development strategy in accordance with present strategic possibilities.

We chose key indices for analysis in terms of directions of balanced economic performances (Table 1).

After necessary calculations in every field of balanced system of economic performances it is important to compare them to their statutory indices, listed in Table 1.

Overall group performance of every separate field of agricultural enterprises activities can be defined according to the following formula:

$$Ii = Xi \times Mi \quad \text{.....(1),}$$

where Xi – the indices characterizing every field of balanced economic performances within the boundaries of i-index:

Mi – weighting of every field.

The formula of overall performance of the use of land resources will look this way:

$$Ol.r. = El. \times Ml.r. \text{ .....(2),}$$

where:

Ol.r. – overall index of the use of land resources;

El. – economic efficiency of the use of land;

Ml.r. – productiveness of the use of land resources.

Economic efficiency of the use of land in agricultural enterprises can be defined with the help of natural and cost indices. The cost of gross product for 100 ha of farming land belongs to cost estimate. The increase of this index is a positive feature.

Economic efficiency of the use of land makes it possible to create favorable conditions for expanded reproduction of land resources and for reduction and relieving negative environmental consequences [15].

Value index of economic efficiency of the use of land is calculated by the formula [18]:

$$El. = \frac{Go}{S} \times 100 \text{ .....(3),}$$

where:

Go – gross output, hrn.;

S – the area of farm lands, ha.

The formula of integrated index of the use of financial resources will look this way:

$$If.r. = \sqrt[5]{Rabs.l. \times Rcov.l. \times 1/Rl.l. \times Roe. \times Rass. \times Mf.r.} \text{ .....(4),}$$

where:

If.r. – integrated index of the use of financial resources;

Rabs.l. – absolute liquidity ratio;

Rcov.l. – liquidity coverage ratio;

Rl.l – long-term attracting of loans ratio;

Roe. – return on equity ratio;

Rass. – return on assets ratio;

Mf.r. – the effectiveness of the use of financial resources

Absolute liquidity ratio characterizes the urgent ability of an enterprise to pay its debts. It shows which part of current liabilities can be covered by an enterprise at the cost of the most liquid assets, namely money assets and their equivalents. The optimal statutory index for agricultural enterprises is more than 0.1 [17].

Absolute liquidity ratio is calculated by the formula:

$$Rabs.l. = \frac{\text{Money assets and their equivalents}}{\text{Current liabilities}} \text{ ..... (5),}$$

Absolute liquidity ratio or coverage ratio characterizes which part of current liabilities an enterprise can satisfy with the help of all current assets [16]. Statutory index of this value is more than 1.

Liquidity coverage ratio is calculated by the formula:

$$Rcov.l. = \frac{\text{Current assets}}{\text{Current liabilities}} \text{ ..... (6),}$$

Long-term attracting of loans ratio characterizes the part of long-term debt of an enterprise within fixed capital. From the viewpoint of financial sustainability the increase of the given index is a negative tendency, which shows the increase of

enterprises dependence from external finances [3].

Long-term attracting of loans ratio is calculated by the formula:

$$Rl.l. = \frac{\text{Long-term liabilities}}{\text{Own capital}} \quad \text{..... (7),}$$

Return on equity ratio (ROE) shows how mush income the owner of the capital obtains from every piece of money invested. It is an important index used for assessment the efficiency of assets [14]. Statutory index of this value – is not less than 1%.

Return on equity ratio is calculated by the formula:

$$Roe = \frac{\text{Net profit (Net loss)}}{\text{Annual average own capital amount}} \times 100\ \% \quad \text{..... (8),}$$

Return on assets ratio (ROA) shows which amount of net profit falls on every hryvnya of assets and characterizes the efficiency of assets use [4]. Optimal statutory index of this value – is 10-20 %.

Return on assets ratio is calculated by the formula:

$$Rass = \frac{\text{Net profit (Net loss)}}{\text{Annual average assets amount}} \times 100\ \% \quad \text{.....(9),}$$

The formula of integrated index of the use of labor resources will look the following:

$$Il.r. = \sqrt[3]{Lpr.\times\ Spr.\times\ 1/\ Rto.} \times Ml.r. \quad \text{.....(10),}$$

where:

Il.r. – integral index of the use of labor resources;

Lpr. – labor productivity;

Spr. – staff profitability;

Rto. – turnover rate ratio;

Ml.r. – labor resources efficiency.

The level of labor efficiency at agricultural enterprises characterizes labor intensity of agricultural production and shows which amount of goods manufactured falls to one employee [9]. The positive tendency is that this index is increasing.

The level of labor efficiency is calculated by the formula:

$$L\ pr. = \frac{Q}{\overline{Ч}} \quad \text{..... (11),}$$

where Q – the amount of goods manufactured;

$\overline{Ч}$ – annual average headcount of staff.

Return on labor index shows which amount of the profit on sales falls to one employee. The increase of this index shows that there is a positive tendency.

Return on labor of the staff is calculated by the formula:

$$Lpr. = \frac{П}{\overline{Ч}} \times 100\ \% \quad \text{..... (12),}$$

where П – the profit on sales;

$\overline{Ч}$ – annual average amount of staff.

Turnover rate ratio is the assessment index of external staff rotation of an enterprise. It is characterized by the correlation of the amount of employees that left the company (apart from the fired ones) to the average annual amount of staff within the respective period [1]. The increase of the given index proves the existence of negative tendency that is why statutory index is its decrease.

Turnover rate ratio is calculated by the formula:

$$Rto = \frac{Af.e.}{\overline{Ч}} \quad \text{..... (13),}$$

where:

Af.e. – the amount of fired employees during accounting period for truancy and other violations of work discipline and also voluntarily (except for reasonable excuses);

$\overline{Ч}$ – annual average amount of staff.

The formula of integrated index of the use of material and technical resources will look this way:

$$Im.\text{-}t.r. = \sqrt[3]{Rwc \times\ Rti.\times Ps.} \times Mm.\text{-}t.r. \quad \text{.....(14),}$$

where:

Im.-.t.r. – the integrated index of the use of material and technical resources;

Rwc – working capital ratio;

Rti. – turnover ratio;

Ps – profitability of stocks;
Mm.-t.r. – the efficiency of the use of material and technical resources.
Turnover ratio is the marker of business activities that characterizes the efficiency of the use of circulation assets of an enterprise. It shows which amount of turnovers the assets perform. The increase of this index shows that the enterprise needs fewer resources for sustaining current activities level. And vice versa, the decrease of turnover rate increases the need for financial resources.
Working capital ratio is calculated buy the formula:

$$Rwc = \frac{SR}{\overline{OA}} \quad \text{..... (15),}$$

where:
SR – sales revenue;
$\overline{OA}$ – annual average amount of circulating assets.
Turnover ratio characterizes the speed of assets disposal. The value of the index shows the amount of turnovers per year [7]. If this index increases this means positive tendency.
Turnover ratio is calculated by the formula:

$$Rti = \frac{C}{\overline{3}} \quad \text{..... (16),}$$

where:
C – the net cost of goods sold;
$\overline{3}$ – annual average cost of material assets.
Profitability of stocks characterizes their relative profitability. The positive thing is the increase of this index.
Profitability of stocks is calculated by the formula:

$$Ps. = \frac{NP}{\overline{3}} \times 100\ \% \quad \text{..... (17),}$$

where:
NP – net profit of an enterprise;
$\overline{3}$ – annual average cost of material assets.
The efficiency of the use of every direction of balanced system of economic performances has been defined by us with the help of peer assessment method. The subjects of peer assessment were scholars investigating problems of agricultural enterprises and experts in agricultural branch. As the investigation results show the highest influence on activities efficiency and the development of agricultural enterprises is made by the effective use of land resources – 0.365. All the rest directions have almost the same influence, namely: the efficiency of the use of labor resources – 0.225, the efficiency of the use of material and technical resources – 0.21 and the efficiency of the use of financial resources – 0.2.
Having defined the integral group index of every separate direction of balanced system of economic performances it is possible to design the line chart which will make it possible to depict and compare the degree of the use of land, financial, labor, material and technical resources. This will make it possible to improve the activity of those directions that operate at their worst.
The formula of overall integral index of balanced system of economic performances will look the following:

$$Iov. = Il.r. + If.r. + Il.r. + Im.\text{-}t.r. \quad \text{..... (19)}$$

Having calculated integrated index of balanced system of economic performances it is possible to outline the level of strategic capability of agricultural enterprise. In order to define this level we built up the respective grading system (Table 2).

Table 2. Grading system of strategic capabilities of agricultural enterprises

Integrated index value of balanced system of economic performances	**Type of agricultural enterprise**
from 0 to 0.35	Enterprises with low level of strategic capabilities
from 0.36 to 0.70	Enterprises with medium level of strategic capabilities
from 0.71 до 1	Enterprises with high level of strategic capabilities

Source: proprietary design of the authors.

As it can be seen from Table 2 we divided agricultural enterprises into three groups by their level of strategic capabilities depending

on the value of integrated index of balanced system of economic performances.

In order to study the trends of using different methods of strategic planning in agricultural enterprises of Ukraine, a sociological study was conducted. The research involved 112 agricultural enterprises of Ukraine. The methods of grouping and statistical analysis have identified the features of strategic planning in small, medium and large farms.

RESULTS AND DISCUSSIONS

Sociological survey results

In order to study the situation of strategic planning at agricultural enterprises the managers of agricultural enterprises of different of legal forms of economic management in Ukraine have been questioned. 112 inquiry forms have been processed. 67.7% of the respondents comprised farm enterprises, 19.4% – limited liability companies and 12.9% – private enterprises. Rather "young" enterprises have been questioned as well as the experienced ones (Fig. 1).

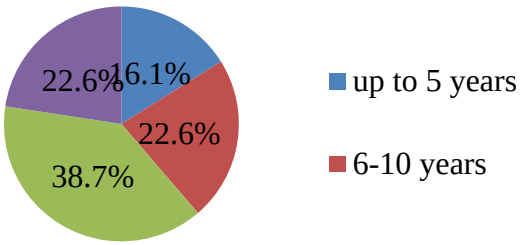

Fig.1. The structure of agricultural enterprises according to the period of their existence
Source: designed on the basis of processed surveys.

As Fig. 1 shows the biggest number of respondents (38.7%) comprised the enterprises that exist more 11-20 years, 22.6% comprised agricultural enterprises that operate 21-30 years and only 16.1% of the respondents – are "young" enterprises that exist less than 5 years.

The peculiarities of forming the strategy of agricultural enterprises are tightly connected with the methods selected for its construction. Strategic planning methods can be the following: input method, target method, method of extrapolation, interpolation method, trial statistical method, criteria method, normative method, balance method, matrix method and strategic planning design.

The results of the survey lead us to the conclusion that most of the questioned respondents use several methods of strategic planning (Fig. 2).

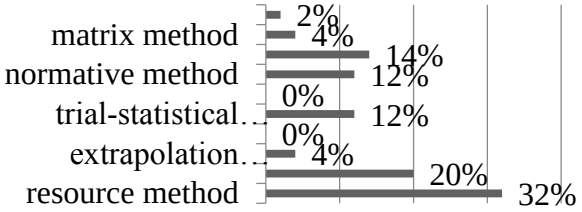

Fig. 2 Strategic planning methods used by questioned respondents
Source: designed on the basis of processed surveys.

As Fig. 2 shows the most popular are the resource method (51.6%) that involves taking into account present resources of agricultural enterprises and the existing market conditions of economic management and the target method (32.3%) that depends on the needs of market and consumers demand. The third place is occupied by balance method used by 22.6% of respondents. The forth place is divided between trial statistical and normative methods used in strategic planning by 19.4% of respondents. The least popular strategic planning methods are the extrapolation method and strategic planning design – 6.5%, 6.5% and 3.2% respectively. As to interpolation and criteria methods none of the respondents uses them. This is obviously caused by unstable conditions of agricultural market environment and the inability of the management of agricultural enterprises to outline ultimate targets of the activities of an enterprise taking into account subaggregates.

When they were asked the question "How the strategies at your enterprise are formed?" the most of the respondents, namely 61.3% answered that they do it on the basis of experience and expertise of the managers, 22.6% – on the basis of intuition and anticipation and only 25.8% that is the fourth of the respondents answered that by the results of the diagnostics of the strategic

management process (Fig. 3).

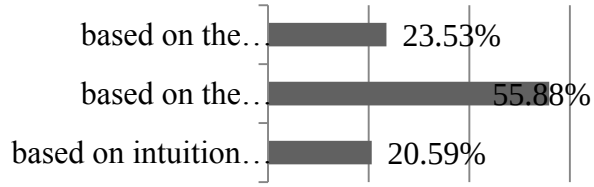

Fig. 3. The principle of strategic measures design among the questioned respondents
Source: designed on the basis of processed surveys.

These results show that the managers of agricultural enterprises are oriented at current activities or they do not realize the advantages or neglecting the results of strategic planning, as it has been mentioned before, 35.5% of the questioned respondents practice strategic planning and 54.8% – practice it partially. This means that the percentage of strategic planning process is higher than the process of forming strategic measures according to the results of the diagnostics of strategic management process.

25.8% of the respondents that plan strategic measures according to the results of diagnostics of strategic management process serve as markers of strategic orientation of agricultural enterprises. It is very interesting to know that all these enterprises have been practicing strategic planning from the very beginning. Besides, 50% of them – are the enterprises that operate less than 5 years, 37.5% – the enterprises that operate 11-20 years and only 12.5% – the enterprises that operate 21-30 years. Thus, we can conclude that the "younger" agricultural enterprises are more strategically oriented as they realize the necessity and the performance of strategic planning under present conditions.

Nowadays, various scholars and practitioners use different methodological approaches to strategic planning. So, N. Ridler, M. Wowchuk, B. Robinson, K. Barrington, T. Chopin, S. Robinson, F. Page, G. Reid, M. Szemerda, J. Sewuster & S. Boyne-Travis use the scenario method analysis and modeling to determine the strategic development potential of Canadian farms [19].

Chi-Lin Yang, Min-Hsien Chiang, Chien-Wei Chen in their study analyzed the effect of financial leverage on the process of strategic planning with the help of methods of internal strategic analysis [8].

Asghar Afshar Jahanshahi, Alexander Brem, used a SWOT-analysis method based on an analysis of top management teams in SMEs in their study on corporate entrepreneurship strategy formation [13].

Dara G. Schniederjans investigated the relationship with incremental business process innovation between SQM and supply chain performance using the method of causal relationships [10].

Shaomin Li, Seung Ho Park, David Duden Selover, exploring the prospects for cross cultural change in developing countries, used the PEST analysis method [20].

The most popular tools of strategic analysis are SWOT- and PEST- the analyses that anticipate the analysis of internal and external environment with the purpose of defining further strategic measures.

Among the total of the questioned respondents 22.6% conduct strategic analysis with the aid of SWOT- та PEST- analysis, 48.4% of the respondents partially apply these tools and 29% – do not conduct strategic analysis at an enterprise which means that they do not use the above-mentioned strategic tools for analysis. This may prove the lack of special qualifications for implementation of strategic analysis tools or lack of understanding the benefit of application the results of this analysis or the inability to use them in real-case scenario.

Under present economic conditions the managers of the most agricultural enterprises start realizing all the advantages of strategic planning. The main advantages that agricultural enterprise obtains from strategic planning are the following:

1) reducing the factors of "uncertain future";
2) timely response to internal and external environmental factors;
3) the presence of essential foundation for strategic and tactical managerial decisions;
4) the ability to evaluate alternative ways of investments;
5) the ability to combine the decisions of all levels of management.

The results of the survey make it possible to analyze which advantages of strategic planning are important for the managers of agricultural enterprises in modern economic conditions (Fig. 4).

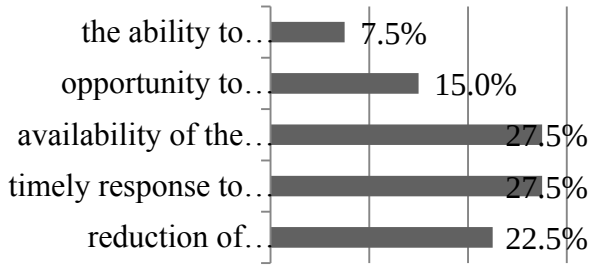

Fig. 4. Structural analysis of the advantages obtained by agricultural enterprises in case they apply strategic planning
Source: designed on the basis of processed surveys.

As fig. 4 shows within the framework of advantages obtained by agricultural enterprises when they apply strategic planning the respondents note timely respond to internal and external environmental factors as well as the presence of essential foundation for strategic and tactical managerial decisions – 35.5% each.

29% of the respondents believe that the important advantage is the reduction of "uncertain future" factors, 19.4% – the ability to evaluate alternative ways of investments and only 9.7% think that it is an advantage to combine the decisions of all management levels. This structure of distribution comes out of inconsistency and instability of external and respectively internal environment, which again proves the importance of strategic planning for agricultural enterprises in present economic conditions.

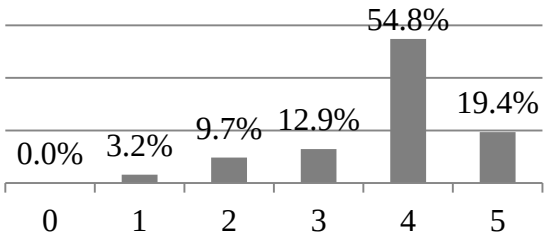

Fig. 5. The assessment of the impact of strategic planning on agricultural enterprises activities (0 – no impact, 5 – maximum)
Source: designed on the basis of processed surveys.

In Fig. 5 you can see how strategic planning improves the activities of agricultural enterprise.

Fig. 5 shows high impact of strategic planning on production improvement of agricultural enterprises. Besides, 19.4% of the questioned respondents assessed this impact as maximum (grade 5), the most of the questioned, namely 54.8% - less than maximum (grade 4/5), 12.9% of the respondents assessed the impact as average (grade 3/5), 9.7% of the respondents – less than average 9grade 2/5) and only small percent of the questioned (3.2%) defined the impact of strategic planning as low (grade 1/5). The positive thing is that none of the questioned admitted the absence of impact of strategic planning on improvement the activities of agricultural enterprises. The respondents that assessed the given interdependence as average or low (1-3 points) belong to those who do not apply strategic planning and have no designed mission or the do it partially, besides the part of questioned that assessed the impact at 1 point do not do it at all.

We can make a conclusion that the managers of agricultural enterprises that apply strategic planning rate high its impact on improvement its activities and it is obvious that the management of those enterprises that do not conduct strategic planning rate its impact as low or average.

When asked the question "Whether your enterprise needs strategic planning?" 77.4% of the respondents gave positive answer, 19.4% – said "probably yes" and only 3.2% – said "no".

The results of the conducted survey among agricultural enterprises of Ivano-Frankivsk show that there exist high strategic potential and prove the necessity of forming and implementation strategy which in its turn has positive effect of improvement the activity of an enterprise as a whole.

Results of research on the level of strategic planning in agricultural enterprises of Ukraine using the balanced system of indicators.

In order to choose the most rational

methodology for developing a strategy for the development of an agricultural enterprise, it is necessary to determine for each area of its activity those indicators that have the greatest impact on the effectiveness of its functioning and development. This should be determined on the basis of a balanced scorecard. The results of calculations of such a system of indicators on the basis of agricultural enterprises of Ukraine are given in Table. 3.

Table 3. The results of the analysis of the balanced system of economic indicators at agricultural enterprises of Ukraine

Sphere	Indicator	Indicator value	
		Regulatory	Estimate
The use of land resources	Gross production for 100 ha of land, El.	increase	0.2696
The use of financial resources	Absolute liquidity ratio, Rabs.l.	more than 0.1	0.0242
	Liquidity coverage ratio, Rcov.l.	more than 1	2.8627
	Long-term attracting of loans ratio, Rl.l.	less than 1	1.4723
	Return on equity (ROE), Roe.	not less than 1 %	15.9427 %
	Return on assets ratio (ROA), Rass.	optimally 10-20 %	4.5015 %
The use of labor resources	Labor productivity, Lpr.	increase	0.9974
	Return on labor (ROL), Rol.	increase	0.5048
	Rate of turnover ratio, Rto.	decrease	0.1
The use of material and technical resources	Working capital ratio, Rwc.	increase	0.8919
	Inventory turnover ratio, Rti.	3-6	1.3088
	Profitability of stocks, Ps.	increase	0.1372

Source: [2].

The generalized results of the calculation of the balanced system of economic indicators at Ukrainian agricultural enterprises are shown in the Table 4.

Table 4. Generalized indicators of a balanced system at agricultural enterprises of Ukraine

Indicator	Method of calculation	Indicator value
The use of land resources	0.2696×0.365	0.0984
The use of financial resources	$\sqrt[5]{0.0242 \times 2.8627 \times \frac{1}{1.4723} \times 15.9427\% \times 4.5015\%} \times 0.2$	0.0404
The use of labor resources	$\sqrt[3]{0.9974 \times 0.5048 \times \frac{1}{0.1}} \times 0.225$	0.3856
The use of material and technical resources	$\sqrt[3]{0.8919 \times 1.3088 \times 0.1372} \times 0.21$	0.1140
The integral indicator	$0.0984 + 0.0404 + 0.3856 + 0.1140$	0.6384

Source: [2].

According to the results of calculations in Table 3 and 4, it can be concluded that the average utilization of labor resources at agricultural enterprises of Ukraine is positive, which is 0.3856. The level of use of land and logistical resources is practically the same, their integrated values are 0.0984 and 0.1140 respectively. The worst situation is the use of financial resources, the size of the integrated group indicator is 0.0404.

The calculated total integral indicator shows that the average enterprises fall in the range from 0.36 to 0.70. This leads to the conclusion that they belong to enterprises with medium level of strategic ability.

CONCLUSIONS

The developed balanced system of economic performances is the basis for defining strategic capability of an agricultural enterprise on the ground of assessment the use of land, financial, labor, material and technical resources. The given system makes it possible to select optimal tools of strategic analysis and methods of strategy design of further development of the enterprise.

Different agricultural enterprises have different present possibilities and needs to conduct strategic analysis and building of a strategy. Thus, the enterprises with high strategic capability that have enough of

financial resources need more detail and precision for strategic analysis, and building of a strategy – more visibility. For enterprises with low level of strategic capability it is enough to apply the easiest methods of strategic analysis and to outline further strategic actions. In order to design the mechanism of formation and implementation of development strategy we use the system of balanced economic performances that presupposes the division of agricultural enterprises into three groups according to the level of strategic capability.

With the aim of organizing the effective mechanism of formation and implementation of development strategy we list below the classification of tools of strategic analysis and methods of strategy building according to strategic capability of an agricultural enterprise (Table 5).

Table 5. Classification of tools of strategic analysis and methods of strategy building according to strategic capability of an agricultural enterprise

Type of agricultural enterprises	Strategic analysis tools	Methods of strategy building
Enterprises with low level of strategic capabilities	SWOT-analysis	"Tree of objectives" method
Enterprises with medium level of strategic capabilities	PEST-analysis, SWOT-analysis, Ansoff matrix, Michael Porter analysis, strategic groups mapping	Road mapping, method of balanced system of indices
Enterprises with high level of strategic capabilities	STEEPLE-analysis, TELESCOPIC OBSERVATIONS, ADL model, McKinsey matrix	Hosing kanri method

Source: proprietary design of the authors.

Thus, on the basis of different possibilities of agricultural enterprises, having divided them into three groups we offer to conduct the design and implementation of the strategy by applying different tools and methods of strategic analysis. For small agricultural enterprises it is better to apply "tree of objectives" while building development strategy, for medium ones – road mapping (road map design) or balanced indices method, and for the big ones – hosing kanri method, which is characterized by integrity and visibility.

Besides, balanced system of economic performances let it define and eliminate the faults in different important directions of enterprises activities.

The use of balanced system of economic performances follows this pattern:

1) calculation of key indices of balanced system of economic performances;
2) calculation of integrated group indices of every branch of activity of an agricultural enterprise;
3) design of line chart of integrated indices of components of balanced system of economic performances in order to define the level of use of land, financial, labor, material and technical resources;
4) calculation of overall integrated index of balanced system of economic performances;
5) defining strategic capabilities of an agricultural enterprise with the help of respective grading system;
6) selection of optimal tools of strategic analysis and methods of development strategy design;
7) design of strategic analysis of an agricultural enterprise;
8) formation and implementation of strategy of an agricultural enterprise.

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UNSOLVED ISSUES IN BULGARIAN TOURISM

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Abstract

Bulgartia is a country that has a multitude of touristic resources – picturesque coastline, high snowy mountains, hundreds of mineral springs, multiple cultural monuments, unique folklore, modern accommodation facilities and others. All of these suggest a flourishing development of Bulgarian tourism. Unfortunately, during the last 10 years the results do not estimate over the humble 3-3.5 billion EUR. An attempt to discover the reason for these mediocre results and to formulate the basic problems – mismatch between demand and supply, overbuilding, lack of labor force, worsened service level and others is made and some measures have been suggested for overcoming the mentioned weaknesses.

Key words**:** *Bulgarian tourism, overdevelopment, overbuilding, level of service, leisure programs*

INTRODUCTION

The subject of the following research are some unsolved problems of Bulgarian tourism and hospitality above all, which hinder the successful and sustainable development of tourism and the generation of enough revenue from tourist activities, which would allow the return of the investments to be made within an acceptable time frame.

At the very end of 20th century, after the privatization of the accommodation facilities in Bulgaria, extensive building of new hotels began as well as a complete reconstruction and modernization of the existing ones. The construction boom continued until the economic crisis of 2008, but it is still a fact today, although it is moving at a slower pace with around 100 to 150 hotels going into exploitation yearly. According to the experts, 20 billion EUR were invested between 1999 and 2019 in the creation of new and modernized accommodation facilities. At the same time, despite the modern accommodation facilities, the revenue from international tourism for the last 10 years has remained unchanged - between 3 and 3.5 billion EUR. With the low level of average annual occupancy of the accommodation facilities – 35-39% according to NSI, tens of years will be necessary for a return of the investments.

The purpose of the present work is to find the main reasons for those unsatisfactory results, to formulate the main issues of the Bulgarian tourism and to target some measures, which would help to solve at least some of those issues.

We currently consider the great mismatch between demand and supply as a major issue restraining the normal development of the Bulgarian tourism. According to expert assessments there are 1.5 million hotel beds. At the same time according to the NSI the foreigners, who visited Bulgaria for tourism in 2018 were around 9 million people [4]. This formally means, that if they arrive at the same time they would occupy the bed capacity for 6 days and during the remaining time of the year it would be idling, which is almost the case in real life.

This major issue leads to a number of others like low occupancy rate, short season, insufficient revenue, low pay and lack of personnel.

MATERIALS AND METHODS

A quantity analysis of various statistical parameters, qualifying the development of the

Bulgarian tourism, has been made in order to fulfill the aim of the current work. Besides the statistical analysis of the official data with NSI and EUROSTAT as a source, various other expert assessments, observations, polls, polls and interviews with specialists from the tourism practice mostly from the southern Bulgarian sea coast have been gathered and analyzed, an analysis of data from ministries, municipal administrations, police offices and others has been made.

Table 1. Travel receipts and expenditure in balance of payments, 2011–2016

	Receipts (million EUR) 2011	2016	Relative to GDP 2016 (%)	Expenditure (million EUR) 2011	2016	Relative to GDP 2016 (%)	Balance (million EUR) 2016
EU-28 n	86, 767	112,299	0.8	87,031	99,054	0.7	13,246
Belgium	9,154	10,492	2.5	14,804	17,614	4.2	-7,122
Bulgaria	2,669	3,285	6.8	647	1,227	2.5	2,058
Czech Republic	5,822	5,703	3.2	3,435	4,447	2.5	1,256
Denmark	4,887	6,373	2.3	7,209	8,283	3.0	-1,910
Germany	27,930	33,818	1.1	61,686	72,085	2.3	-38,267
Estonia	897	1,345	6.4	579	1,048	5.0	297
Ireland	3,010	4,685	1.7	4,817	5,619	2.0	-934
Greece	10,505	13,207	7.6	2,266	2,006	1.2	11,201
Spain	44,711	54,660	4.9	12,493	17,437	1.6	37,223
France	39,334	38,301	1.7	32,029	36,464	1.6	1,837
Croatia	6,608	8,627	18.6	632	853	1.8	7,774
Italy	30,891	36,358	2.2	20,584	22,547	1.3	13,811
Cyprus	1,835	2,489	13.7	942	1,061	5.9	1,428
Latvia	553	783	3.1	549	628	2.5	155
Lithuania	943	1,090	2.8	616	913	2.4	177
Luxembourg	3,497	3,669	6.9	2,715	2,545	4.8	1,124
Hungary	4,243	5,121	4.5	1,781	1,954	1.7	3,167
Malta	911	1,307	13.2	239	369	3.7	938
Netherlands	9,230	12,697	1.8	14,836	16,336	2.3	-3,639
Austria	14,267	17,400	4.9	7,531	8,799	2.5	8,601
Poland	7,680	9,908	2.3	6,055	7,204	1.7	2,704
Portugal	8,146	12,680	6.8	2,974	3,849	2.1	8,831
Romania	1,019	1,568	0.9	1,408	1,930	1.1	-362
Slovenia	1,974	2,190	5.4	818	854	2.1	1,337
Slovakia	1,745	2,483	3.1	1,567	2,023	2.5	460
Finland	2,745	2,467	1.1	3,502	4,692	2.2	-2,225
Sweden	7,316	11,407	2.5	10,048	13,083	2.8	-1,676
United Kingdom	27,610	37,413	1.6	40,065	58,396	2.4	-20,983
Iceland	-	2,173	11.9	-	1,146	6.3	1,027
Switzerland	12,359	14,692	2.4	9,884	14,926	2.5	-234
Montenegro	:	835	:	:	60	:	775
Former Yugoslav Rep. of Macedonia	172	253	2.6	81	163	1.7	90
Albania	:	1,528	14.2	:	1,139	10.6	389
Serbia	710	1,040	3.0	791	1,085	3.1	-45
Turkey	17,927	16,911	2.2	3,509	4,312	0.6	12,599
Kosovo ([2])	532	690	11.5	157	142	2.4	548

Source: Statistics Explained – europa.eu [7].

This is necessary because of a certain imperfection of the NSI's methodology in collecting primary data of the number of beds, tourists who have stayed, overnight stays and others. This is due to the fact that up to 2006 the NSI reports only accommodations above 30 beds, and after 2006 – those above 10. This means that hundreds of thousands of beds in apart-hotels, apart-villages, categorized as individual guestrooms, a great part of the

family hotels, guest houses, rooms, etc. are not officially counted and do not take part in the analyses and forecasts, which creates unreal picture of the current state and possibilities of Bulgarian tourism.
The multiannual theoretical and practical experience in the area of tourism and hospitality of the author of the paper has been used in analyzing the situation.

RESULTS AND DISCUSSIONS

From the EUROSTAT data can be seen, that in 2016 even countries with less territory than Bulgaria which have no sea outlet a realize much higher revenue than Bulgaria from national tourism: Czech Republic 5,703 mill. EUR, Hungary 5,121 mill. EUR, Luxembourg 3,669 mill. EUR [7] and we cannot even compete with our direct competitors from the region.
If we analyze the EUROSTAT data for the period 2011-2016, we will find out that the revenue from international tourism in Bulgaria was increased from 2,699 million EUR to 3,285 million EUR or for 6 years it increased by 21.7% with 6.8% contribution of the tourism branch to the GDP of Bulgaria. At the same time the expenses of Bulgarian citizens for travelling abroad increased from 647 mill. EUR to 1,227 mill. EUR, so the increase was 89.6%, which was 2.5% of the GDP for 2016.
The positive balance from international tourism for 2016 equals only 2058 mill. EUR, or mere 4.2% of the country's GDP.
During the same year Croatia contributed 18.6% to its GDP from tourism, Cyprus – 13.7% and Malta – 13.2%[7].

Table 2. Revenue from international tourism in Bulgaria (mill. EUR)

Receipts			Expenditure			Balance
2011	2016	%GDP 2016	2011	2016	%GDP 2016	2016
2,699	*3,285*	*6.8*	*647*	*1,227*	*2.5*	*2,058*

Source: Statistics Explained – europa.eu [7].

If the number of foreign visitors to Bulgaria for tourism and the volume of revenue from foreign tourists are compared, we will see how insignificant the increase in both parameters is, considering the significant amount of beds for tourism in the country:

Table 3. Income from tourism in bill. EUR

Year of income	Income in bill. EUR
2018	*3.7*
2017	*3.5*
2016	*3.3*
2015	*2.9*
2014	*3.2*
2013	*3.1*
2012	*2.9*
2011	*2.85*
2010	*2.75*

Source: Statistics Explained, www.nsi.bg [4].

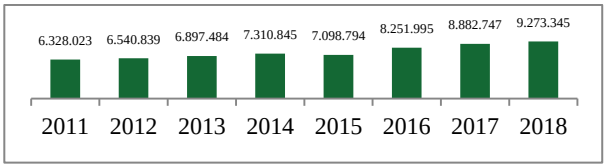

Fig. 1. Tourist visits of foreigners in Bulgaria.
Source: Adapted to www.nsi.bg [4].

It can be calculated from the mentioned data that the receipts from 1 tourist in Bulgaria for 2014 amounts to 438 EUR while at the same time in Greece it amounts to 610 EUR, and in Turkey – 753 EUR.[6]
It is a matter of correlations rather than a comparison of absolute numbers since there are major specific differences in the kind of tourism practiced in the different countries. On the other hand, Bulgaria has much more capabilities compared to the realized business results.
The number of tourists, the revenue and profitability are totally different indicators which are not necessarily directly proportional. For the accuracy of the data regarding the number of the foreign visitors we could rely on the border control statistics. On the other hand, regarding the revenue, the methodology that the NSI uses is uncertain as is uncertain what and how is measured as revenue from tourism. The number of tourists, the average stay of a single tourist, the revenue from a tourist, etc. are important for the rate of profitability. Generally, the higher the number of tourists, the more variable costs there are. The shorter the average stay is, the bigger the costs per tourist are.
What are those low business results of the Bulgarian tourism due to? The problems are

multiple and complex. We will not address the lack of strategy and policies for tourism development and the efficiency of the existing (or planned) ones as far as they exist. We will focus on a few economic, technical and institutional issues.

For us the first and major problem of the Bulgarian tourism at present is the great discrepancy between the demand and the supply of our tourist product.

If we follow the data of the NSI for 2017, we can calculate that with 66,467,503 possible stays (bed-nights) and with 26,054,096 nights spent, the coefficient of the accommodation rate was 39.2%[4]. Even calculated this way, the occupancy rate is low despite the seasonal type of our tourism – the supply is 3 times greater than the demand. However, this percentage has been calculated through the operating period indicator (191 days for 348 728 beds reported for the country) [4]. The operating period as an indicator is suitable for planning the amount of the expected stays (number of beds multiplied by operating period). But it is determined according to the number of days which the accommodation facilities have reported as operational. However, in reporting the number of possible stays should be calculated on the basis of a period of 365 days because of the fixed costs and the term of investment return. Calculated this way it appears that the occupancy rate for 2017 has actually been just 20.47%. This shows us that during 4/5 of the years the beds were empty.

The following questions then arise:

(i)How reliable are the data reported? While the NSI reported for example the availability of 314,257 beds for 2014 for the whole country and 120,217 beds for Burgas Region [4], at the same time a joint inspection of the police and the municipal administration of Nessebar, Burgas Region, reported 600,000 beds only in the territory of the municipality. According to expert assessments the number of beds in the country is around 1.5 million, i. e. five times as big as the one reported. Part of the issue lies in the fact that since 2006 the NSI has been reporting only above 10 beds in a single building, and all apartment villages and hotels are categorized as rooms (up to 5 beds in a building). Part of the persons who have stayed in family-run hotels, guesthouses, rooms, etc. have not been reported, i.e. over half of the beds have not been reported. The number of beds reported by the municipalities is more precise but the percentage of categorized building still remains dubious. The NSI data of the number of beds do not coincide with those of the municipalities and they are not considered in making official analyses and forecasts. The existence of such a big discrepancy between the official and the actual number of beds is really surprising having in mind that while misrepresenting the number of tourists, overnight stays and receipts is comparatively easier, there is such a lot of construction documentation for the buildings, and besides they can be physically counted.

(ii)On condition that according to the reports of the NSI in 2017 Bulgaria was visited by 8, 882,747 foreigners (not counting the transients), and the foreigners who stayed in the accommodation facilities were 3,655,830 people [4], the following question arises: Where did the rest 5,226,917 stays? Is it possible for 59 % of the inbound foreign tourists to stay with friends and relatives, in their own places, in the field, in their cars? The figures show that the unreported numbers of tourists and overnight stays, and therefore receipts, are almost twice as big as the ones officially reported.

(iii)Why is the task of controlling the numbers of beds and tourists, the receipts and service quality assigned solely to the Commission for consumer protection? Their prerogatives include control not only over tourism but on all activities related to trade and services. The members of the commission responsible for the entire southeast of Bulgaria (the regions of Burgas, Sliven and Yambol) are ten in number. With the huge number of establishments in this part of Bulgaria this means that during their entire working lives they would not be able to exert control over each establishment even once. And since the great significance of tourism for our economy is widely proclaimed, why isn't there a quality

controlling body functioning under the aegis of the Ministry of Tourism?

The issue of the discrepancy between demand and supply of our tourist product leads to a number of other problems:

(a)**A prolonged term of capital investment return**. According to expert assessments for the past 20 years since 1999 over 20 billion EUR has been invested in constructing and renovating accommodation facilities. With 670 mill. EUR in revenue from the accommodation facilities (for 2017) [4], even at 40% return on sales (although such profitability seems fantastic) it will take 70 years to return the investment made, if the data of the NSI are real.

(b)The insufficient volume of revenue causes **the problem of the low level of remunerations in comparison** with that in destinations that are our competitors on the tourism market. The duration of the season is short, employment is low, receipts are insufficient and instead of directing more adequate efforts towards increasing sales to achieve the needed profit and profitability, the firms choose the easier way of cutting costs. And it is a fact known from practice that expenses and consumables are the easiest to cut. However, these cuts lead directly to a **fall in the level of service.** If we comply with the average international norm of one staff member attending to four guests to achieve a high-performance culture of service, then the establishments in and around the resort of Sunny Beach for example (400,000 beds) will need 100,000 staff, and the number of people employed in them is between 20,000 and 30,000. The low level of remunerations and the short season bring about the high mobility of the personnel. The costs related to hiring and training staff increase, the establishments work with employees who tend to be less and less qualified. There is also the fact that, on the one hand, the majority of the staff are temporary, without trade union protection, and on the other hand, they are confronted by the associated owners of establishments who act as a cartel and keep salaries and social contributions down. In addition, the widely applied all-inclusive plan makes it impossible for the staff to make extra income. While the prices of the main services in the competitor destinations are almost equal to ours, the salaries there are times higher than those in our resorts, and as a result most qualified employees leave the country.

(c)Insufficient receipts lead to **deterioration in service quality** in catering establishments as well. Ingredients of lower quality and cost, sometimes in insufficient quantities, are put in the kitchen produce and as finished products, which causes the tourists' dissatisfaction. The smaller number of sales entails a risk either of having old supplies, or lacking immediate readiness for sale. Therefore the quantities of supplies ordered are smaller, which increases the delivery costs.

The issue that mostly repels both Bulgarian and foreign tourists is the **overdevelopment of the tourist areas**.

The norms for tourism territorial planning in our country comply with the European practice – with 50 % green areas, half of them afforested [2], our resorts should be buried in greenery; with ten square meters per tourist, they should feel comfortable on the beach. However, in reality in some places the tourists are accommodated in 'Chinese walls', and on some beaches there is no room to even sit. For example, the length of the beach in Sunny Beach is 6,000 m with a width of 30 – 60 m. This means that the beach covers about 300-350 decares and it can accommodate around 30,000 people according to the norm [5] - the number of people for which the resort was once designed. Nowadays there are over 350,000 beds in the resort. The same is the situation in Sozopol. With the capacity of the two beaches 'Central' and 'Harmanite' for 7,000 people the beds in Sozopol are over 70,000. And it is not just a matter of beaches. With ten times more newly built beds the technical infrastructure must be changed, and that includes the capacity of substations, switch-yards, water and sanitation installations, ozonators, waste-water treatment plants, landfill sites, etc.

Perhaps this overdevelopment is also the fault of the way of measuring the beaches intended for concession. They are not measured

according to the length and width of the usable beach strip, but by the coordinate points of the beach - the curves of the beach strip, river beds, lands of nearby territories, thus including dunes, gravel, green areas, shrubs, trees, etc. [3] The amounts of money paid for these unrealistically large areas are considerable and the concessionaires try to find ways to compensate them. That is why the beach strip is full of establishments, beach umbrellas, sun loungers, etc. However, the concessionaires are formally right. With the vast beach strips thus measured, naturally they fit in the legal requirements. They are not interested in the fact that the beach strip that is actually usable is filled with establishments, chargeable sun loungers and umbrellas, whose price exceeds the price of an overnight stay, that the tourists are dissatisfied, that they move to unguarded beaches, that they would hardly choose this destination again. This way of granting concessions should be changed. The beach strips should be granted under concession in their real dimensions to the owners of beach-side hotels, catering establishments, municipalities, etc. that are interested in finding ways to keep the tourists and make their stay more enjoyable.

A fact that is even more unacceptable is that this way of measuring the beach territories justifies the issuing of numerous permits for construction and overdevelopment, although practically the beach strips used cannot accommodate such an enormous number of tourists.

Disputes between investors and eco-organizations over the overdevelopment of beaches arise all the time despite the legal provisions. Very often due to the lack of cadaster plans, less stringent control, corruption appetites or the desire of some municipalities to increase their revenue from tourism and real estate sales, structures are erected even on natural dunes declared protected areas. Legal disputes then begin whether the construction site is or is not on dunes. The disputes drag on they enter the public domain and turn potential tourists against the controversial place.

The issue whose solution could be expected to solve at least part of the above mentioned problems is related to the **average stay of a single tourist and leisure management.**

The number of realized overnight stays and persons who stayed can be used to calculate that the average stay of a single tourist in the accommodation facilities in our country was 3.65 days for 2014, and for 2017 - 3.49 days [4].

What is behind this figure? First, the short average stay means more tourists with fewer overnight stays, which increases the amount of variable expenses, decreases the the rate of return on sales. The spending on consumables for replenishing and cleaning the rooms is increased as are labor expenses, etc. It is a very frustrating fact that every year the average stay decreases by 1-2 tenths of the day, and converted into money this means around 28 million BGN less in revenue for every tenth of the day. Second, which should make us start thinking seriously, is that the short average stay means lack of diversity, lack of interest on the part of the tourists to extend their stay.

On condition that every year dozens of hotels with thousands of beds go into operation in our country, the average stay and the occupancy rate of the bed capacity cannot be increased by the reported minor growth in the number of tourists. The fact that our hotels are comparatively new and modern and they are sold at low prices does not mean that our competitors would stay in the same place. The tourist is aware of the fact that hotels have beds. And everywhere there are fancy hotels, pools, bars, etc.

The issue of the short tourist season is related to the short average stay of a single tourist and hence the short operation period of the facilities. The curve of the seasonal fluctuations in Bulgarian tourism attests to its pronounced dependence on mass tourism, and largely on recreational beach tourism. For 2017 the NSI reports the existence of 348,724 beds in the country, of which 237,153 are in the regions developing mostly beach tourism - Burgas, Varna and Dobrich have 68% of the total number of beds in the country. Of

26,054,096 nights spent in the country those in the three regions are 17,255,093, which is 66%, and of 1,340,089,000 BGN revenue from overnight stays, they have 905,781,150 BGN, or 68% of the total revenue [4]. The figure also shows how short the peak tourist season is. The main reason for this is the uniformity of supply and the lack of enough leisure options.

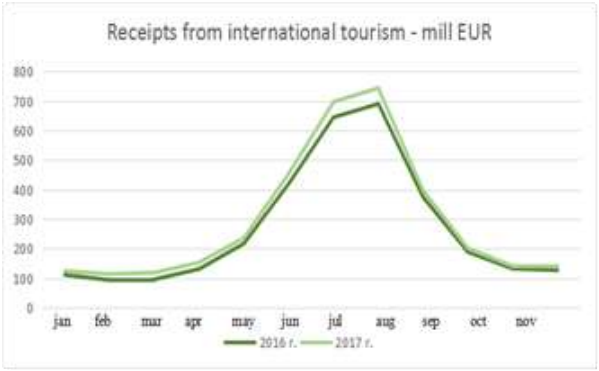

Fig. 2. Receipts from international tourism (million EURO) - annual data.
Source: Adapted to www.bnb.bg [1].

The owners of facilities, state and municipal authorities and non-government organizations must give priority to aiming their joint efforts at improving leisure options, diversifying tourists' stay, making it more attractive in order to extend the tourist season and the average stay.

Perhaps the first thing to be done is to create a single register of attractions. Currently no one knows how many and what kind of attractions there are in Bulgaria, nor whose property they are or who and how manages them. It is necessary to establish an organization for operating them because at present a lot of them are underutilized and due to the insufficient receipts they cannot support themselves, so the level of service deteriorates.

Leisure diversification can undoubtedly happen successfully through developing **alternative types of tourism**. It is a well-known fact that their development is very useful for extending the season and increasing the occupancy rate, average stay, revenue volume, etc. Bulgaria is well endowed in this respect - it is rich in natural and anthropogenic resources. The problem is that if we want to achieve success, the development of these types of tourism must be strategic and integrated, not sporadic; they must be completed and their finished state should satisfy the tourists and provide a competitive advantage.

Unfortunately, Bulgaria is the poorest country in the EU and does not have the necessary funds. The issues that have to be solved are many and the competitive development of each type of alternative tourism will probably cost no less than 10 billion BGN.

Let us take for example the alternative kinds of tourism that are commented on most often:

(i)Rural tourism. Bulgaria is an incredibly beautiful country with unique nature and authentic folklore. But tourism means consumption. One of its advantages is that goods are sold for foreign currency, which is termed as 'hidden export'. However, we import over 80% of the foods we need and what we have is the opposite effect.

A rural family has on average 2-3 decares arable land which does not enable them to be engaged in farming effective enough to meet their own needs, not to mention catering for tourists. Probably the problem of land consolidation must be solved first.

Rural areas are depopulated with an aging population and workforce shortage. It is not possible for one and the same person to be engaged both in tourism and farming. Farms, co-operatives or other forms should be established, effective farming should be organized, livelihoods should be provided to make young people return to the countryside. Only then rural tourism will develop naturally, unlike the present situation in which rural hotels go bankrupt all the time or become hotels in the countryside which are stocked by the big suppliers.

More effort should be made to train the population in customer care - professional skills, hygienic habits, personal touch, tourists' safety, etc. When we advertise environmental cleanliness we should present the necessary evidence - at the moment certificates for ecological foods (people's own produce) are not issued anywhere, there is no research, no air quality certificates, etc.

The building of technical, tourism and social infrastructure at the necessary level in smaller towns and villages requires enormous funds.

(ii)**Cultural and informative tourism**. Although Greece, Italy and Bulgaria are considered to be the countries richest in antique monuments in Europe and despite our unique folklore and other anthropogenic achievements, we cannot say that we have considerable success in developing cultural tourism as a separate kind of tourism. The main reasons for this are that developing it competitively requires a lot of money and the competition is fierce. Our neighbor Greece is lucky that Hellenic art served as a model for the culture of ancient Rome, and during and after the Renaissance - for the culture of the whole of Europe (although among the exhibits there might have been Thracian works of art) The same applies to Turkey and to a lesser degree to the other Balkan countries including Bulgaria. It would be hard to compensate this publicity that evolved over the course of history even with a lot of funds. Currently, due to the fierce competition it is unrealistic to rely on a keen interest taken in this product by our neighboring countries. Markets that are further away do not distinguish Bulgarian culture among the cultures of the Balkan countries. A lot of money is needed to introduce prospective tourists to Bulgarian history and culture, to Bulgaria's contribution to the European and world development.

On the other hand, substantial funds are necessary to build both technical and tourism infrastructures - accessibility, safety, designation, car parks, visitor centers, etc.

(iii)**Spa tourism**. Bulgaria is the second richest country in mineral springs in Europe after Iceland – over 550 fields with 1,600 springs, 90 % of which are curative [6]. By their chemical composition, mineralization, temperatures, gases and microorganisms they are similar to the world's best known mineral springs. We have large deposits of curative firth mud and healing peat. These resources combined with our unique nature and favorable climatic conditions provide opportunities for combining spa and climatic treatments. Then why aren't the results impressive?

Certain success has really been achieved, but mostly in the development of domestic tourism and by means of the social support of the NSSI and the National Health Insurance Fund. However, here, too, we come across certain impediments:

-In reality social spa tourism that could provide a basis for international spa tourism has been monopolized by two firms - „Specialized Hospitals for Rehabilitation – National Complex EAD" and „Prophylaxis, rehabilitation and recreation EAD" and their subsidiaries. This practically takes us back to the conditions of centrally planned economy. Profit is collected from their departments and centralized. Upkeep expenditure increases. The funds for reconstruction and modernization are allocated centrally and the facilities look unkempt. The employment rate and profitability achieved are at the expense of maintenance expenditure and low salaries with big workload and staff shortage. The centralized public procurements lead to the deterioration of the quality of catering and service;

-Extremely limited leisure opportunities. Visitors are usually engaged with procedures until noon, but their afternoons and evenings are free. In most places they rely mainly on eco-trails, but the majority of the guests are elderly people with health problems. After the procedures they need to relax and this is hardly the most suitable way of spending their free time. There are not enough opportunities for quiet games, including gambling. Hotel entertainment, attractions, interest-oriented activities, etc. are not available almost anywhere. There is not even daily press in some places. Excursions, where they are offered, are arranged by unlicensed tour operators, and very often by drivers of passenger vans;

- As the access regime is specialized, and the development of this kind of tourism is monopolized by the two firms, in reality the hotels which have good conditions for spa tourism remain without the support of the NSSI and NHIF. For them this type of tourism

is accompanying rather than main activity. Their employment rate and results are low - Bulgaria is in the 92nd place in the world by the population's standard of living and few people can afford their expensive services. Although the health insurance funds of the countries in the EU fund the spa services, in reality this possibility is not used. The share of international tourism in spa tourism is around 10 % with tourists from Greece and Turkey being the most frequent visitors.

It is obvious that large funds are necessary to develop these and other types of alternative tourism successfully, to make them competitive and highly profitable and Bulgaria does not have them. That is why we think that without neglecting the rest of the types of tourism, we must predominantly develop one type. In our opinion this is spa tourism. We have the most favorable conditions for its development - unique natural resources, facilities which are developed to a measure, accumulated skills and traditions, though insufficient, but still it is not like starting from scratch, potential markets, etc.

CONCLUSIONS

The unsolved issues of Bulgarian tourism are so many that it is impossible to cover them in a single article – problems with pricing, revenue management, staff training (due to the lack of state standards each educational establishment includes subjects according to their academic staff, imperfect legal framework and many more.

But we have to somehow start solving them at some point. It is our view that the first thing that has to be done is to establish a center for tourism planning, analyses and forecasts under the aegis of the Ministry of Tourism. Tourism resources have to be identified and SWOT analyses have to be made - analyses, a single strategy for the development of Bulgarian tourism and its types. The practice of selecting specialized teams tasked with developing comprehensive 'leisure projects' in places identified as tourism sites must be introduced.

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DIFFERENTIATION OF RENT FOR AGRICULTURAL-PURPOSE LAND

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Abstract

Through processing the information on existing methods of lease, problematic situations on lease agreements of agricultural-purpose land held in shared ownership are studied in the article. The existing methods of rent under land lease agreements in case of joint lessor by the municipal districts of the Saratov region are considered thoroughly. It is established that the most common is the rent-in-kind. According to the study, it is advisable to use the monetary form of rent for improving the financial-and-economic results of agricultural production of business entities. The result of the study is the development of the method of differentiated rent. Using the SWOT-analysis the proposed method is scientifically substantiated, measures for threat manageability putting advantages of the method strengths, use of favorable opportunities to overcome its weaknesses, reduction of the adverse impact of the combination "weaknesses – threats" are determined. The recommended method reflects the land rent received in specific production conditions, taking into account the product yield, allows lessees and lessors to invest free funds. The method of calculating the differentiated rent is based on determining the anticipated net operating income depending on the level of agricultural crop productivity, land market price taking into account the discount rate. This method is focused on agricultural producers who are lessees and lessors of agricultural-purpose land held in shared ownership, executive authorities and managing bodies of agro-industrial complex.

Key words**:** *rent, agricultural-purpose land, rent differentiation method, land plots, shared ownership*

INTRODUCTION

Agricultural-purpose land lease is a non-gratuitous possession and use of land for agricultural production based on the agreement.

Land share is understood as a part of the agricultural-purpose land owned by the right of ownership to the person entitled to receiving and leasing it to a business entity [25]. Land lease in case of joint lessor (practically that is leasing the land shares to an agricultural organization by all shareholders of the farm) is not defined in the conceptual sense neither in the Civil Code nor in the Land Code of the Russian Federation [2, 7]. By-laws on this issue serve as guidelines, as they provide for the owner the free choice of the right to dispose his/her land share (pai). The same shareholders may act as lessees and lessors. This type of lease is not provided with the necessary legal framework and needs to be amended and streamlined.

The instrument for increasing the efficiency of lease relations is determining and setting fair rent rates under the lease agreements for agricultural-purpose land plots held in shared ownership.

Difficulties in calculating the rent under land lease agreements in case of joint lessor are manifested in the absence of regulation in contrast to the lease of land plots held in state or municipal ownership, in relation to which the Resolution of the Government of the Russian Federation № 582 of July 16, 2009 "On basic principles of determining the rent at leasing the land plots held in state or municipal ownership and the rules of determining the rent rate as well as the procedure, conditions and time limits of rent payments for the lands owned by the Russian Federation" is in force [14].

The study of existing methods of determining the rent under the land lease agreements in case of joint lessor in the subjects of the Russian Federation contributed to the

identification of different approaches to this issue. The development of land lease is one of the factors for improving the efficiency of agricultural-purpose land use. Land owners prefer to lease them out and that allows overcoming a high investment barrier to business entities that do not have sufficient funds for the purchase of land for production purposes. Lease does not restrain the economic initiative, forms an effective lessee, because he/she is equally interested in the rational use of both own land and leased land [24]. The relevance of the development is determined by the possibility of using the proposed method of calculating the rent under lease agreements of land plots from agricultural-purpose land held in shared ownership in accordance with the main financial-and-economic results of agricultural production of the business entity.

The novelty of the study consists in scientific substantiation of the method, proposition of options for calculating the rent in accordance with the main financial-and-economic indicators of agricultural production of the business entity.

The fundamental provisions of the classical economists A. Smith [18], D. Ricardo [15] A. Marshall [9] and the most famous Russian scientists I.N. Buzdalov [1], S.N. Volkov [22], A.S. Mindrin [10], A.E. Sagaidak [16], N.I. Shagaida [8, 17] A.M. Yugay [23] etc. are of substantial significance for the development of methods of calculating rents.

The central objective of the research is developing a method of calculating the rent under lease agreements of land plots from agricultural-purpose land held in common ownership. To solve it, it is necessary to identify problematic situations, analyze information on the existing rents and offer areas for the application of the author methodology.

MATERIALS AND METHODS

In this paper, using the SWOT-analysis the proposed method is scientifically substantiated.

The procedure for calculating the rent depending on the level of crop productivity, anticipated net operating income, land market price, taking into account the discount rate is as follows.

(i)The average actual crop productivity for the last *n* years is determined.

(ii)The range of estimated productivity is selected taking into account favorable climatic conditions for the subsequent number of *n* years.

(iii)Net operating income (*R*, RUB/ha) is calculated from actual data:

$$R = P_{crop} \times (P_{sales} - C),$$

where:

P_{crop} – crop productivity, t/ha;

P_{sales} – sales price, RUB/t;

C – cost of production, RUB/t.

(iv)The predicted values of net operating income per 1 ha are formed using the statistical function "Forecast.lin".

(v)The land price (*V*, RUB/ha) is calculated at the discount rate:

$$V = R_{land} / e,$$

where:

R_{land} – land rent – net operating income derived from crops growing, RUB/ha; *e* – rate of return of capital, or discount rate.

(vi)The amount of rent is calculated (A_{rent}, RUB/ha):

$$A_{rent} = V \times k_{rr},$$

where:

k_{rr} is the rent rate under the lease agreement, in the example $k_{rr} = 0.03$.

RESULTS AND DISCUSSIONS

Theory

Lease of land plots from agricultural-purpose land occupies an important place in the system of land relations, especially from the point of view of effective land use. The determining factor is the rent rate for the land

share which must satisfy the legal and economic interests of the lessee and the lessor.

The land rent can be set in monetary form, in kind or in the form of services. Principally, there is a tendency to use different options of payment in-kind for the use of land shares for agricultural production. Its monetary equivalent is paid in rare cases, mainly under the court decision in case of non-payment or incomplete payment of the rent-in-kind by the lessee. As a rule, the rent includes several types of payments: fodder or food grain, sunflower oil, sugar, flour, etc. As well almost always various services are provided within the structure of the rent. The monetary form of rent is peculiar to highly profitable collective agricultural organizations and peasant (farmer) farms. With the effective functioning of the land market, agricultural-purpose land acquires liquidity and an increase in rent for land shares is observed.

It should be assumed that the rent-in-kind should be present within the system of lease payments, as it expresses the interest of the consumer (lessor) in receiving grain, grain screenings, straw, hay for the development of livestock raising on private subsidiary farms, vegetable oil, grain cereals, sugar as food products.

The most progressive types by the economic content include the monetary form of rent which provides the land share owner with ample opportunities to purchase the necessary products, commodities and services. It is required to take into account the balance of interests of lessee and lessor in a fair setting of the rent rate. Rent rate depends on many factors. It should be kept in mind that differential rent I (produced by natural fertility and location) is wholly owned by the land owner, i.e. the lessor, while the differential rent II (produced from the additional investment of capital in improving the fertile properties of the soil and the use of innovative technologies) must belong to the lessee.

Analysis of the data on the rent rate begins with the collecting the necessary information which is divided into structured and unstructured.

Structured information is the useful information with which you can choose the appropriate method of calculating the rent: official materials of the Ministry of Agriculture of the Russian Federation [11], Federal Service for State Registration, Cadastre and Cartography (Rosreestr) [4], Federal State Statistics Service (Rosstat) [5] and their territorial administrations [3, 12, 13], land Internet portals [19] and other sources [6, 20, 21, 26, 27].

For assessment the systematic collection of data on the rent rate paid in kind (grain, straw, etc.) and in value (monetary) terms per land share by the municipal districts of the Saratov region is carried out. This information important for decision-making is unstructured and requires significant material, time and financial costs.

Non-transformed structured and unstructured information is extracted from the operational database for detailing. The up-to-date level of software development allows carrying out computer analysis and giving an objective assessment of the current situation on the rent under the lease agreements of land plots from agricultural-purpose land held in shared ownership. For analysis it is necessary to have the option of quick handling of information, presenting it in different aspects, making ad hoc queries to it, and that is provided by the formation of a single data warehouse for their integration and coordination. Profile information can be presented in a specialized local storage – on the data mart (relational or multidimensional). The transformed information is used in the analysis procedures from the point of view of multiple measurements and for intellectual analysis, the technology of which allows substantiating the methods of calculating the rent under lease agreements scientifically.

After performing these operations with the use of software and hardware, the differentiation of rent under lease agreements is carried out and the most suitable for a particular business entity is selected from this analysis. The forecast of factors and final

indicator of agricultural production is developed. The appropriate parameters to select the method of calculating the rent are set. At the final stage, the target information on the rent rate under lease agreements of land plots from agricultural-purpose land held in shared ownership, in accordance with the main financial-and-economic results of agricultural production of business entity is formed.

Practical significance, suggestions, results of experimental studies

Payment for land shares with grain, straw, hay, flour, grain cereals, sugar, sunflower oil, as well as through the provision of certain services is the most common in the Saratov region. In many cases, mixed (combined) forms of rent payments for the land share are used when lessee simultaneously makes payments to the lessor in the following options: 1 – grain, straw, sunflower oil, flour, grain cereals, sugar, money; 2 – grain, straw, sunflower oil; 3 – grain, straw, flour; 4 – grain, money. Peculiarities of the combined form of rent are manifested not only in connection with the production activities of agricultural organizations but also with the climatic conditions of their location. For example, in Alexandrovo-Gaysky district, located in the arid South-Eastern microzone and having estuaries, the rent due to the low yield of grain crops is provided by the lessee to the owner of the land is not grain but straw and hay.

The rent-in-kind for the land share is mainly paid with grain. The lessor's need for grain is determined by the need for livestock raising on the private subsidiary farm, for sale and by other reasons. In 26 districts of 38 municipal districts of the Saratov region, lessors receive rent in grain in the amount of up to 1t; in 11 districts – 1-1.5 t; in 7 districts –1.5-2 t; in the other 7 districts –2-2.5 t per land share. In some cases, lessors were provided with 3 or more tons of grain per a land share: in Samoilovsky district – 3t; in Balashovsky district – 3.1 t; in Krasnokutsky district – 4 t. Lessees practice provision of grain screenings per a land share along with the rent paid with grain. So, in Perelyubsky district for all agricultural producers (limited liability companies, agricultural production cooperatives and other organizational-legal forms) the main type of a rent is assumed providing the landowners with grain screenings – 0.8 t, hay – 0.5 t per a land share for development of livestock raising on private subsidiary farms.

Barley straw and millet straw are useful and nutritious fodder for big and small cattle, wheat straw quality is significantly worse. Straw as well as grain is provided as a rent for the land shares use. At most both types of products are provided for this purpose. The authors made a grouping of municipal districts of the Saratov region by the rent rate paid with straw per a land share. In the group 1 including 2 districts – Atkarsky and Novoburassky the rent rate paid with straw per a land share is up to 1t. Groups 2, 3 and 4, which chose a similar form of payment with lessors, have almost the same number of districts – 11-12 and the rent rate paid with straw per a land share: in group 2 it is 1-1.5 t; in group 3 it is 1.5-2 t; and in group 4 it is 2-2.5 t. Of all groups, the random nature is observed in the group 5 where the rent rate paid with straw per a land share is 2.5-3t, in such amounts the rent was provided only in Krasnokutsky district. Group 6 includes 9 districts and the rent rate paid with straw per a land share is more than 3 t. Thus, the rent rate paid with straw has a wide range – from 0.4 to 6 t per a land share. These changes are closely related to the production and economic activities of agricultural organizations and their financial capabilities.

Statistical data on the use of rent-in-kind in the Saratov region show that settlements with lessors are carried out not only with grain, straw and hay but also with processed products. The most popular type of rent is the settlement with sunflower oil. Thus, in Atkarsky district, the majority of peasant (farmer) farms pay the owners of land shares with sunflower oil in the amount of 5-10 l per a land share along with other forms of rent. In Dukhovnitsky district, peasant (farmer) farms provide for these purposes up to 25 l of sunflower oil per a share. The only district

where the rent is not paid with such products is Krasnokutsky district. In 3 districts of the region – Atkarsky, Dukhovnitsky, Krasnopartizansky – the rent is mainly provided with flour, grain cereal or sugar if 50-100 kg of one of the specified processed products are due per a land share under the agreement.

A survey analysis of the amount of rent paid in monetary form per a land share in the municipal districts of the Saratov region gave the following results. The maximum rent rate in monetary form per a land share was noted in one district – Krasnopartizansky (31,700 RUB). Monetary funds in the amount of 15,000-20,000 RUB were paid in 3 districts of the region – Arkadaksky, Ekaterinovsky, Krasnopartizansky. In 6 districts – Arkadaksky, Balashovsky, Ekaterinovsky, Kalininsky, Krasnoarmeysky, Sovietsky – the rent rate varied from 10,000 to 15,000 RUB. The rent in the range 5,000-10,000 RUB was paid in the region most commonly, this group includes 9 districts: Arkadaksky, Atkarsky, Balakovsky, Balashovsky, Dukhovnitsky, Ekaterinovsky, Ershovsky, Romanovsky, Samoilovsky. The lowest rents under special agreements were noted in Baltaysky, Ekaterinovsky, Krasnoarmeisky, Krasnopartizansky, Marksovsky, Pitersky and Hvalynsky districts up to 5,000 RUB per a land share.

Table 1. Strategic areas of the rent differentiation method

Strengths ↔ Opportunities		
Strengths	Opportunities	Measures
Joint participation of lessee and lessors in income	Using the net income in the most effective areas	Scientific substantiation of the rent for each particular agricultural organization
The joint participation of lessee and lessors in production risk	Increasing the responsibility of lessee and lessors in the economic-and-financial results	Joint participation of lessee and lessors in the development of a business plan
Joint participation of lessee and lessors in the costs for improving the productive properties of the soil	Positive impact on the increase in crop production and livestock raising	Purchasing of mineral fertilizers at the expense of lessee and part of the rent of lessors
Development of commodity-money relations between lessee and lessors	Opportunity of an agricultural organization for full control of crop products	Selection of the most profitable channels for the sale of grain and other crop products. Increase of profitability of a business entity
Compensation of rent by lessee to the lessors from the harvest of the next year in case of crop failure in the dry year	Credibility of lessors to lessee on the terms of getting rent under the lease agreement	Conclusion of a long-term lease agreement in case of joint lessor
Strengths ↔ Threats threat manageability using strengths		
Strengths -	Threats	Measures
Joint participation of lessee and lessors in income	Understatement of income share for the rent payment of to lessors by lessee	Legally correct registration of lease agreement between the parties, especially in terms of distribution of net income
The joint participation of lessee and lessors in production risk	Disagreement of lessors to participate in production risk	Conclusion of the lease agreement with the lessors accepting this condition or change of approach to the rent setting
Joint participation of lessee and lessors in the costs of improving the productive properties of the soil	Deficiency of effect from fertilizer application in a dry year	The use of fertilizers during irrigation. Investment in organic fertilizers with long-term after-effect
Development of commodity-money relations between lessee and lessors	Non-use of the proposed method by private subsidiary farms because of the profitability of rent-in-rind	Affording the purchase of natural products for running the private subsidiary farm within the rent amount
Compensation of rent by lessee to the lessors from the harvest of the next year in case of crop failure in the dry year	Getting crop failure for 2-3 years	Availability of reserve from the harvest of favorable years or reservation of own funds for these purposes
Weaknesses ↔ Opportunities taking advantage of favourable opportunities for overcoming weaknesses		
Weaknesses	Opportunities	Measures
Complexity of the distribution of grain amount between lessee and lessors in percentage and physical terms of its gross yield	Scientific substantiation of rent taking into account specifics of economic activity of the agricultural organization	Analysis of the economic activity of the collective agricultural organization, determination of its financial capabilities
Risk in obtaining a low net income due to the low selling price of grain	Determination of profitability of grain sales taking into account the time factor	Sales of grain to another region (abroad) or increase in demand for it in the domestic market
Inefficiency of the proposed method for unprofitable agricultural organizations	Lease of high-fertile land, providing the best financial-and-economic results from the cultivation of the most profitable crops	The conclusion of the lease agreement of land shares in case of joint lessor only on crop rotation plots with high soil bonitet
Weaknesses ↔ Threats reducing the adverse impact of a combination "weaknesses – threats"		
Weaknesses	Threats	Measures
Complexity of the distribution of grain amount between lessee and lessors in percentage and physical terms of its gross yield	Negative impact of excessive rent paid by lessee on the economic activity of the agricultural organization	Scientific substantiation of the rent rate
Risk in obtaining a low net income due to the low selling price of grain	Low rent due to low net income received by an agricultural organization	Reducing the rent to lessors with the insertion of this condition into the lease agreement
Inefficiency of the proposed method for unprofitable agricultural organizations	The possibility of commercial failure of an agricultural organization	Financial recovery of the agricultural organization according to the current federal and regional legislation

Source: Own elaboration.

The presented analytical material provides substantial, though not complete, factual information on the rent rate per a land share paid in kind and in monetary form, and the reasons for that. It is revealed that the predominant form of rent, which is used by economic entities (collective organizations and peasant (farmer) farm) in their activities in the municipal districts of the Saratov region, is a rent-in-kind. This is quite understandable position of lessees and lessors, caused primarily by the grain market situation and their own economic situation. Rent-in-kind is a product of simple and contracted reproduction. The monetary form of rent per a land share is peculiar to the lessees conducting economic activity in the conditions of the extended reproduction.

Differentiation of rent takes into account the joint participation of the lessee and lessors in income, production risk, costs for improving soil fertility, the development of commodity-money relations between them, compensation of rent to lessors by the lessee from the next year's harvest in case of shortage due to adverse weather conditions in the current year.

The practical significance of the application of the proposed method of calculating the rent is in preserving the shared ownership, rational use of funds, sustainable agricultural production, contributing to the improvement of the fertile properties of the soil, increase in crop productivity, rent use efficiency.

The areas of application of the method of calculating the differentiated rent under lease agreements of the land plots from agricultural-purpose lands held in shared ownership are presented in Table 1.

The differentiated rent is determined according to the main financial-and-economic results of agricultural production of the business entity (Table 2, Fig. 1).

Table 2. Options for calculating the rent under the lease agreement, taking into account the discount rate on the example of grain crops

Year	Grain crop productivity (P_{crop}), t/ha	Net operating income (R_{land}), RUB/ha	Land price, (V), RUB/ha	Rent (A_{rent}), RUB/ha
2012	1.07	1,224.40	12,244.01	367.32
2013	1.53	1,517.30	15,173.01	455.19
2014	1.77	2,185.24	21,852.42	655.57
2015	1.33	3,098.77	30,987.67	929.63
2016	2.1	5,063.10	50,631.00	1,518.93
2017	2.7	5,149.17	51,491.70	1,544.75
forecast	2.1	3,906.10	39,061.04	1,171.83
forecast	2.3	4,401.21	44,012.14	1,320.36
forecast	2.5	4,896.32	48,963.23	1,468.90

Source: Calculated by the authors from statistical data.

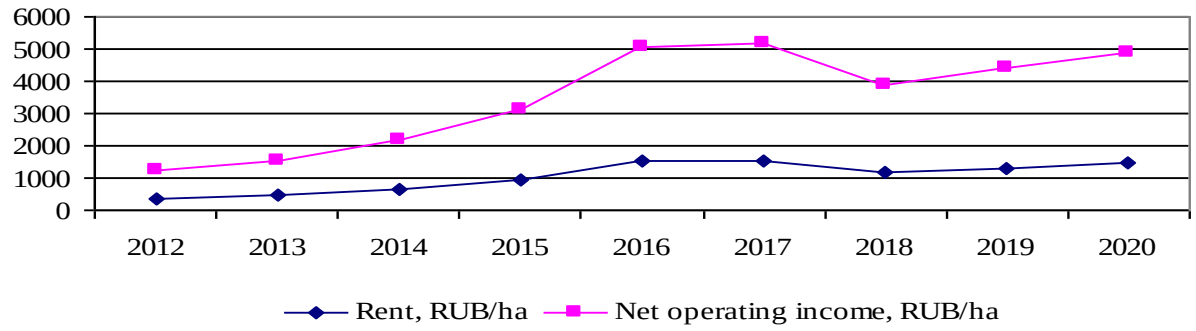

Fig. 1. Estimated indicators of net income and rent in 2012-2017 and the forecast period
Source: Own elaboration.

The developed method of calculating the rent under land lease agreements has become widespread among agricultural producers of municipal districts of the Saratov region

through the regional Ministry of Agriculture, Association of Peasant Farms and Agricultural Cooperatives "Vozrozhdenie", Saratov Regional Trade Union Organization of Agricultural Workers of the Russian Federation.

CONCLUSIONS

Non-compliance with the balance of interests, violation of property rights and lease, complexity of the calculating the rent and its payment, emergence of abandoned and degraded land block the development of rent relations. To address these problems the method of calculating the differential rents under leases of land plots from agricultural-purpose lands held in shared ownership. The article presents the options of the developed method of calculating the rent under lease agreements of land plots from agricultural-purpose land held in shared ownership, depending on the productivity of agricultural crops, share participation in net income, estimated net operating income, land market price taking into account the discount rate. Rent in the amount of 1,468.90 RUB/ha is possible to be paid if estimated grain productivity is 2.5 t/ha.

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