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C O N T E N T S

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EFFECT OF ORGANIC AND ORGANOMINERAL FERTILIZERS ON GROWTH AND YIELD OF OKRA IN NEMATODE INFESTED SOIL OF OGBOMOSO NORTH LOCAL GOVERNMENT, OYO STATE, NIGERIA

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Abstract

Field and screen house trials were conducted during planting season of 2014 and 2015 to investigate the influence of organic and organo mineral fertilizers on okra grown in root knot infested soil. Okra variety Clemson spineless was grown with five levels of organo mineral fertilizer :(1.5,2.0,2.5,3.0,and 3.5 t/ha),five levels of organic fertilizer (1.5,2.0,2.5,3.0,and 3.5 t/ha) and the control. The experiments were laid in a randomized complete block design with four replications. Data analysis using ANOVA at 5% level of probability showed the applications of organic and organo mineral fertilizer to have enhanced plant growth and fruit production significantly: number of leaves, plant height, fruit yield, root gall index and soil nematode population were significantly affected by different level of organic and organo mineral fertilizer rates. The results of the okra fruit yield and yield components showed that application of 2.5 and 2.0 t/ha of organo mineral fertilizer produced the highest number of fruits of (2,274.7g) and (2,349.6) respectively. Applications of treatment reduce nematode population and associated damage. The study therefore recommends organic and organo mineral fertilizer rate of 2.0 t/ha for the production of okra in root knot nematode infested soils.

Key words**:** *fertilizers, nematode, Okra, organic, organo mineral*

INTRODUCTION

Okra (*Abelmoschus esculentus* L) is an important vegetable crop in Nigeria and it is widely cultivated throughout the tropics. It is found in almost all markets in Africa [14]. It is a good source of vitamin A, B, C and also rich in protein, carbohydrates, fats, minerals, iron and iodine [3]. Nutritionally therefore, the production of fruit vegetable like okra will help in alleviating the nutritional need of Nigerians
Nematodes have the greatest impact on crop productivity attacking the roots of seedlings immediately after seed germination [11]. Nematode feeding also creates open wounds that provide entry to a wide variety of plant pathogenic fungi and bacteria. These microbial infections are often more economically damaging than the direct effects of nematode feeding. A balanced soil ecosystem supports a wide variety of biological control organisms that helps keep nematode pest population in check.
Earlier researches conducted on the use of extracts of Neem (*Azadirachta indica*), Mistletoe (*Viscum album*), Lantana (Lantana spp.), Lemon grass (*Cymbogo nitrates*), Castor oil (*Ricinus communis* L), Mustard (*Brassica juncea*) were reported to be effective in the control of root-knot nematode [8]. Also, [9] reported that the addition of compost decrease nematode pest and resulted in increased crop growth and yield. There is substantial evidence that the addition of organic matter in form of compost or manure will decrease nematode pest populations and associated damage to crops [17; 7; 1; 16]. This could be as a result of improved soil structure and fertility, alteration of the level of plant resistance, release of nemato-toxins or increased populations of fungal and bacterial parasites and other nematode-antagonistic agents [2]. Reduced nematode damage from increased organic

matter in soil is likely a combination of these interactions. Higher organic matter content increases soil's water-holding capacity and supports thriving communities of the decomposers and predators that make up the soil's digestive system. Thus, the aim of this research is to assess the effectiveness of organic and organo-mineral fertilizers, in the control of soil borne nematodes pest of okra.

MATERIALS AND METHODS

The study include screen house and field trials conducted between 2014 and 2015 cropping seasons at the teaching and Research Farm and screen house of the Ladoke Akintola University of Technology, Ogbomoso, Nigeria. Ogbomoso lies on longitude 4'10^{0}E, latitude 8'10^{0}N and is located in the guinea savannah zone of Southwestern Nigeria. The temperature ranges from 28-33^{0}C with humidity of about 74% all year except in January when there will be dry wind blow. Rainfall distribution is bimodal and extends eight to nine months of the year. On the average the annual rainfall is about 1,286 mm [10].

Organic and organo-mineral fertilizers used as treatments was collected from Sunshine fertilizer company, Akure, Ondo state while the soil sample and root knot infested plant materials were collected from Teaching and Research farm of Ladoke Akintola University of Technology, Ogbomoso, Nigeria. This soil had been earlier reported to be infected by root knot nematodes [9].

At planting and immediately after harvest, 250ml soil was collected from the experimental pots and field for nematode bio-assay. The soil was assessed for nematode using microscope, as described by [18] and [15]. Nematodes would be identified using CIH Nematode description guides of the UK. Also, pre and post harvest soil samples was taken per block at the depth of 0 -15 cm for physical and chemical analysis, nematode population assessment and soil nutrient status. The sample taken was bulked to form a composite sample. Root gall indices were scored after [13] scale of 1 - 5. Nutrient analysis of the experimental soil, organo-mineral and organic fertilizers were carried out.

The experimental design was randomized complete block (RCBD) with four replications and the treatments were five levels of organo mineral fertilizers; 1.5 (T_2), 2.0 (T_3), 2.5 (T_4), 3.0 (T_5), and 3.5t/ha (T_6), five levels of organic fertilizer; 1.5 (T_7), 2.0 (T_8), 2.5 (T_9), 3.0 (T_{10}) and 3.5 t/ha (T_{11}) and the control (T_1)

Greenhouse experiment: Each pot was inoculated with 5,000 nematode juveniles. Nematode susceptible okra seeds from Seed project, Kano were planted in each pot at 3-4 seeds per pot, which was later thinned down to 1 healthy plant per pot, and treatments (organo mineral fertilizer and organic fertilizer rates) were applied at two weeks after germination. Each treatment was replicated four times making a total of forty-four (44) pots. These were laid out in a randomized complete block design (RCBD). Control of insect pests was done by spraying with Neem based compost using hand sprayer according to [4].

Field experiment: The field experiments were carried out during the 2014 and 2015 cropping seasons. At planting, soil samples were taken and assessed for nematode population counts by the modified Baermann technique [18]. Nematode susceptible okra seeds from Seed project, Kano were planted at 3 -4 seeds per hole and later thinned down to 1(one) healthy seedling per stand at 1-week after germination. Treatments of organo mineral and organic fertilizers rates were applied in a randomized complete block design (RCBD) with four replications. The total experimental plot was 33 by 15m (495 m^2). Each treatment plot was of 3 by 3m plot size and each block was separated by a space of 1m. The crops were spaced out at a distance of 50cm by 1m. Control of insect pests was done by spraying with Neem based compost using hand sprayer according to [4].

Data were collected on plant height, number of leaves, fruit number and weight, root gall index, initial and final nematode population on the field and in the pot. Analyses of the data collected were carried out using ANOVA at 5% level of probability where the separated

means were subjected to Duncan Multiple Range Test.

RESULTS AND DISCUSSIONS

The analysis of soil, organic and organo mineral fertilizer (Table 1) showed the presence of organic carbon, organic matter, nitrogen, calcium, potassium, sodium, iron, magnesium, zinc, copper, lead and cadmium to be moderate in the soil and high in the organic fertilizer which shows good management during its production and storage. Chromium and nickel were present in organo mineral fertilizer but were absent in organic fertilizer.

Table 1. Result of the analysis of the soil, organo mineral and organic fertilizer

	SOIL	**OM**	**OF**
pH	6.7	5.8	5.5
Organic Carbon(%)	9.5	40.3	36.5
Organic matter(%)	16.38	69.48	62.93
Nitrogen(%)	1.74	4.4	3.7
Calcium($CmolKg^{-1}$)	0.38	1.48	0.48
Potassium($MgKg^{-1}$)	0.65	2.63	0.75
Sodium($CmolKg^{-1}$)	0.57	2.74	0.53
Iron($MgKg^{-1}$)	0.32	1.47	0.18
Magnesium($MgKg^{-1}$)	1.02	1.63	0.38
Zinc($MgKg^{-1}$)	1.18	1.8	0.12
Copper($MgKg^{-1}$)	0.24	0.36	0.13
Lead($MgKg^{-1}$)	0.1	1.23	0.02
Cadmium($MgKg^{-1}$)	0.13	1.3	0.02
Chromium($MgKg^{-1}$)	0.05	0.35	ND
Nickel($MgKg^{-1}$)	0.04	0.23	ND

OM = Organo mineral fertilizer, OF = Organic fertilizer

The application of organic and organo mineral fertilizer had significant effects on the vegetative parameters taken. The height of okra plant in the field and the green house was affected by the treatments at 10WAP and 6WAP respectively, where the addition of treatments at T3 , T4 T4 in field and T3 , T5 in green house produced significant taller plants when compares with other treatments (Table 2).

At 10WAP, application of organo mineral fertilizer at T3 and T5 produced significantly higher number of leaf. In the green house however, organo mineral fertilizer rate of T2 had significantly higher leaves number than other treatments.

The yield parameters of okra was significantly affected by the organic and organo mineral inputs in this study.

The addition of organo mineral at T3, T4 and organic fertilizer at T8 produced the highest number of fruits per plant (3.67) which was not significantly different from the addition of T2 (3.33). In the green house trial however, T2, T3 and T4 gave the highest number of fruits per plant (4.0).The mean weight of fruits was also significant in both experiments with treatments T2, T3 and T4 producing the highest mean fruit weight of 30.0 g, 32.01 g and 30.99 g respectively in the field and 48.69 g, 51.76 g and 40.52g respectively in the green house trial.

The okra fruit yield was most favoured with the application of organic and organo mineral fertilizers in these studies. The treatments T3 and T4 gave the yield of 2,349.6 kg/ha and 2,274 kg/ha in the field trial, respectively while in the green house the same trend was observed with the least yield from the control (Table 4).

Table 5 showed the effects of organic and organo mineral fertilizers inputs on the root gall index and nematode population in these study. The treatments had significant effects on the parameters taken. The root gall index decreased significantly due to the application of T7 in the field and T7, T8 in green house trial when compared with the control (untreated soil).

The population of the nematode was also reduced drastically as a result of the application

of organic and organo mineral fertilizers. In the field trial the addition of T7 and T9 significantly reduce the nematodes population while the treatments T4, T8 and T9 in green house trail when compared with other treatments. This agrees with [1]; [2] who reported the potential of some composted agro industrial wastes as a management option for suppression of plant-parasitic nematodes.

Such suppression was also demonstrated for organic amendments derived from forestry industry residues [6]. The effect of organic amendments on suppression of plant parasitic nematodes may be due to enhancement of the indigenous soil micro fauna and flora [12].

Table 2. Effect of organic and organo mineral fertilizer on the mean height okra

Treatments	Field				Greenhouse			
	4WAP	6WAP	8WAP	10WAP	4WAP	6WAP	8WAP	10WAP
T1	7.00a	7.67a	7.67a	8.00b	5.00a	4.67b	6.00a	7.33a
T2	7.33a	7.67a	8.67a	9.00ab	5.00a	5.67ab	7.33a	10.00a
T3	7.33a	7.67a	9.00a	9.33ab	4.67a	5.33ab	7.33a	9.00a
T4	7.33a	7.67a	9.00a	9.67a	5.00a	5.33ab	7.33a	8.00a
T5	7.33a	7.33a	9.00a	9.33ab	4.67a	5.00ab	7.00a	9.67a
T6	7.33a	8.00a	8.67a	9.33ab	5.66a	6.33a	7.66a	9.67a
T7	7.00a	7.33a	9.00a	9.33ab	5.00a	5.67ab	7.67a	10.00a
T8	7.00a	7.67a	8.33a	9.00ab	4.33a	5.00ab	6.00a	6.33a
T9	7.00a	7.33a	8.33a	9.00ab	5.33a	6.00ab	7.33a	9.33a
T10	7.00a	7.67a	8.33a	8.67ab	5.33a	5.33ab	6.33a	8.33a
T11	7.00a	7.67a	8.33a	8.67ab	4.67a	5.00ab	7.00a	9.33a
	NS	NS	NS		NS		NS	NS

Means followed by the same letter(s) along the same column are not statistically different at 5% probability level according to Duncan Multiple. Range Tests (DMRT).NS: Not significant at 5% probability level.

Table 3. Effect of organic and organo mineral fertilizer on the mean number of leaf of okra

Treatments	Field				Greenhouse			
	4WAP	6WAP	8WAP	10WAP	4WAP	6WAP	8WAP	10WAP
T1	10.33a	18.67a	27.57a	32.67d	20.83a	30.33ab	36.00c	40.33d
T2	10.00a	22.78a	31.57a	49.33ab	23.33a	39.33a	59.33a	67.33a
T3	10.50a	22.00a	29.23a	49.67a	19.50a	30.67ab	46.33abc	65.33a
T4	11.17a	22.33a	33.00a	48.33ab	22.03a	30.67ab	44.33abc	62.67ab
T5	11.33a	23.23a	33.90a	51.00a	20.27a	30.67ab	45.33abc	58.33abc
T6	10.00a	22.00a	31.67a	47.67ab	18.00a	31.67ab	51.00abc	60.67ab
T7	9.50a	20.67a	29.67a	47.67ab	22.50a	33.33ab	51.67ab	61.33ab
T8	10.17a	22.44a	30.44a	45.67abc	20.50a	30.00ab	40.00bc	54.00bc
T9	10.17a	20.33a	30.23a	47.67ab	20.50a	32.33ab	50.67abc	59.67ab
T10	10.50a	21.77a	29.57a	42.00bc	19.83a	30.00ab	41.00bc	48.33cd
T11	10.00a	21.00a	28.57a	39.67c	18.00a	29.00b	42.00bc	48.33cd
	NS	NS	NS		NS			

Means followed by the same letter(s) along the same column are not statistically different at 5% probability level according to Duncan Multiple Range Tests (DMRT). NS: Not significant at 5% probability level.

Table 4. Effect of organic and organo mineral fertilizer on the mean yield of okra

Treatments	FIELD			GREENHOUSE		
	No of fruit/plt	Mean Fruit Weight (g)	Yield (Kg/Ha)	No of fruit/plt	Mean Fruit Weight (g)	Yield (Kg/Ha)
T1	1.67b	16.87c	563.4d	2.00d	13.80g	552.0f
T2	3.33a	31.04a	2,067.3ab	4.00a	48.69a	3,895.2ab
T3	3.67a	32.01a	2,349.6a	4.00a	51.76a	4,140.8a
T4	3.67a	30.99a	2,274.7a	4.00a	40.52b	3,241.6b
T5	2.33ab	22.97bc	1,070.4cd	3.33abc	29.57cde	1,969.4d
T6	2.33ab	22.82bc	1,063.4cd	2.67bcd	24.99def	1,334.5e
T7	3.00ab	24.75ab	1,485.0c	3.67ab	29.96cde	2,199.1cd
T8	3.67a	29.24ab	2,146.3ab	3.67ab	32.62bcd	2,394.3c
T9	3.33a	28.95ab	1,928.1b	3.67ab	33.74bc	2,476.6c
T10	3.00ab	26.88ab	1,612.8bc	2.67bcd	22.34ef	1,193.0ef
T11	3.00ab	22.34bc	1,340.4c	2.33dc	20.67fg	963.3ef

Means followed by the same letter(s) along the same column are not statistically different at 5% probability level according to Duncan Multiple Range Tests (DMRT). NS: Not significant at 5% probability level.

Table 5. Effect of organic and organo mineral fertilizer on the root gall index and nematode population

Treatments	FIELD			GREENHOUSE		
	Mean Root Gall Index	Initial nematod population (200 ml soil)	Final nematode population (200 ml soil)	Mean Root Gall Index	Initial nematod population (200 ml soil)	Final nematode population (200 ml soil)
T1	4.00c	1,001	2,175d	3.33c	980	1,500c
T2	2.67bc	987	1,750bc	2.33bc	975	1,320bc
T3	2.00b	996	1,770bc	2.00b	950	1,250b
T4	3.67c	1,005	1,925c	1.67a	910	1,170a
T5	2.67bc	980	1,755bc	2.33bc	965	1,300bc
T6	2.67bc	991	1,700b	2.33bc	950	1,310bc
T7	1.67a	970	1,552a	3.00c	980	1,250b
T8	2.67bc	1,001	1,760bc	1.67a	900	1,180a
T9	2.33b	990	1,600a	1.67a	895	1,150a
T10	2.33b	1,004	1,650ab	2.00b	915	1,200b
T11	2.67bc	997	1,720bc	2.00b	940	1,155a

Means followed by the same letter(s) along the same column are not statistically different at 5% probability level according to Duncan Multiple Range Tests (DMRT). NS: Not significant at 5% probability level.

CONCLUSIONS

The addition of the different fertilizer types gave a significant increase in the height and number of leaves of okra plants as compared with the untreated control. This work agrees [5] who reported that application of organic manure gave vigorous development in plant which is indicated in plant length, number of leaves, stem as well as shoot dry weight. Similar result was reported by [10] that the growth parameters such as plant height and number of leaves showed increasing response in pepper when treated with two levels of nitrogen, phosphorus and potassium 15-15-15 fertilizer (NPK) (0 and 250 kg. ha^{-1}), five levels of organo mineral fertilizers (0, 2, 3, 4 and 5 t. ha^{-1}) and their various combinations.

There were significant reduction in the final nematode population and the root gall index in many of the treated okra plants as compared with the control. Based on the result of this study, it is obvious that root-knot nematode disease on okra can be effectively controlled and good yields obtained with the application of organic or organo mineral fertilizers.

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ASSESSING THE DETERMINANTS OF THE PUSH AND PULL FACTORS INFLUENCING PARTICIPATION IN FISH FARMING IN OSUN STATE, NIGERIA

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Abstract

The study determined and assessed the push and pull factors influencing participation of people in fish farming enterprise with a view to reducing fishpond abandonment in the State. Multistage and proportionate sampling procedure was employed to select 240 fish farmers from the three agricultural zones of the State. Data were collected with validated and structured interview schedule. The data were described with percentage, mean and standard deviation while inferences were drawn with factor and regression analyses. Results showed the mean age of the farmers to be 48± 9 years. Majority were married with household size of 6±3 people. The farmers had good formal education. Out of the nine factors isolated to influence participation in fish farming, only three were identified to pull people into the enterprise while six pushed people away. It was then concluded that if the scenario should continue, the future of fish farming is bleak in the country and the cost of fish importation would continue to be on the high side.

Key words**:** *determinant, push and pull factors, participation, fish farmers*

INTRODUCTION

Nigeria being an agrarian society has great employment potential for the country's teeming population in fish farming due to friendly and fish farming sustainable environment. But despite these outstanding potentials (which ranges from fish breeding, fish production, processing and marketing of fish and fish products), there are quite a large number of unemployed individuals who do not see fish farming enterprise as a worthwhile means of livelihood. Fish farming is uniquely placed to reverse the declining supplies from captured fisheries and the activity has notable potentials for new livelihood opportunities, providing the mechanism for lower priced fish, enhanced nutritional security and employment for poor communities by servicing urban markets [15]. However, there are factors attracting (pull) and repelling (push) from this enterprise. [3] reported that despite the wide acceptance of fish farming as an income generating activity in Nigeria, its contributions to total domestic fish production has not been very encouraging. Today, aquaculture is the fastest growing livestock production sector in Nigeria, with a growth of about 29% in 2006 alone, and with prospects of continued growth. This is because demand for fish is on the increase line with population growth, while catches from fisheries are on the decline, even globally [9]. Nigeria as the second largest aquaculture producer in Africa only produced 200,535 tonnes in 2010 [11]. There is huge gap between demand and production of fish in Nigeria, the gap was 0.22 million tonnes in 2012 [11]. In 2010 alone, for instance, Nigeria's fish demand stood at 2.66 million metric tons, and the country had to spend 100 billion naira on fish importation annually [18]. However, [8] reported reasons for slow growth in fish production in African countries as including; technical problems such as poor species, inadequate finance for fish farming, input and political and or economic instability. Some of these reasons may push individuals away from fish farming. Movement in and out of fish farming is very dynamic and the rate at which individuals are pulled and pushed from fish farming are part of an adjustment and restructuring in the farming industry which operates with different intensities at different times depending on a combination of

exogenous and endogenous pressures [7]. This distinctive pattern would rather likely depend on both the push and pull factors.

Nigeria is one of the largest importers of fish with a per capita consumption of 7.52 kg and a total consumption of 1.2million metric tonnes with imports making up about 2/3 of the total consumption. Aquaculture, the rearing of fish and other aquatic organisms, has high prospects in Nigeria. With a projected population of 139.1 million people in 2007, the fish demand is estimated at 1.06 metric tonnes, while supply stands at 0.81 metric tonnes leaving a deficit of 0.25 metric tonnes [10]. However, local fish production has been below consumption with imports accounting for about US$ 48.8 million (₦7.8 billion) in 2002 [6]. The development of the fish industry will increase local production of fish and save much of the foreign exchange being used for fish importation. Specifically, fish farming has a special role of ensuring food security, alleviating poverty and provision of animal protein. Less than 50% of the total annual fish consumed by Nigerians are produced locally. There is, therefore, the need not only to maximize the exploitation of the nation's fishery resources but to concentrate more on the development of aquaculture which has the greatest potential to increase fish production for local consumption and export. Despite these opportunities, some individuals still abandon their fish farms for other enterprises. The question is, what are the factors pushing people away from this resource filled enterprise? What pulled them into it initially? Some researchers have been able to establish the prospects and challenges of fish farming as well as its profitability as an economic activity, such include; [4], [5] and [13]. Reports from literature contain abundant information on fish farming with little emphasis on push and pull factors influencing peoples' participation in the enterprise, hence the need for this study. In the light of the above, the study provides answer to the following research questions: What are the socio-economic characteristics of fish farmers? Why do people participate in fish farming? Why do people abandon fish farming? What are the pull and push factors influencing fish farming?

Objectives of the study

(i) describe the socio-economic characteristics of the fish farmers in Osun State; and

(ii) examine the push and pull factors influencing participation in fish farming.

MATERIALS AND METHODS

Study area

This study was carried out in Osun State of Nigeria. It is located in the South western region of the country and lies within coordinates 7°30′N, 4°30′E. The mean annual temperature ranges between 27.2^{0}C in the month of June and 39.0^{0}C in December. The rainfall ranges between 1,420 mm in the rainforest belt to 1,133 mm in the savanna. The vegetation allows for agricultural production which provides an enabling environment for the inhabitants' major occupation, which includes various agricultural activities. They are also involved in some non-farm activities.

Target population, sampling procedure and sample size.

Fish farmers in Osun State were the tar get population for this study. A multistage and proportionate sampling procedure was adopted for the sample selection. At the first stage, 20per cent of the LGAs in each zone were selected. This was followed by proportionate selection of six LGAs from the zones. Four communities prominent with fish farming were purposively selected from each LGA. Finally, systematic sampling technique was used to select ten fish farmers from the list of fish farmers from each selected community. A total of 240 fish farmers were selected and interviewed for the study.

Reliable and thoroughly validated interview schedule was adopted for the study. Data collected were described with mean and standard deviation while factor analyses and regression were used to make inference.

Measurement of variables

There are two major variables, dependent and the independent variables. Dependent variable was participation. This was measured on a five point Likert type of scale. This was scored

from 0 – 4 and a participation index was generated which was used to run against other independent variables.

Independent variables were measured either on a binary scale of yes or no or direct figures given by the respondents were used as in case of age, number of years spent in formal education, number of extension contact among others. All the variables were subjected to varimax rotation to generate factor which were later regressed to show the direction and magnitude of the factors.

RESULTS AND DISCUSSIONS

Socio-economics characteristics

Results in Table 1 show that majority (83.4%) of the respondents were middle aged (41-60 years) and still in their productive years in fish farming. The mean age of the respondents was 48±9 years. This result shows that a higher proportion (83.3%) of the respondents were male. Also that a little more than half (52.1%) were Muslim and the remaining 47.9 per cent were Christian. Majority (94.2%) of the respondents were married with only 4.6 per cent being single and the remaining 1.2 per cent was widowed. The mean household size was 6±3. Findings showed that fish farmers in the study area were highly educated. This might be due to the technical know-how involved and high technicality required of fish farming. This finding corroborates that of [16], [13] and [14].

Factors influencing people's participation in fish farming.

The factors influencing participation is further divided into push and pull factors to show those factors that are attracting farmers and those that are repelling them from fish farming enterprise.

In an attempt to categorize the various variables influencing peoples' participation in fish farming, factor and component analysis were used to isolate the crucial factors influencing participation in fish farming.

The relevant variables were inter-correlated and ran with varimax factor rotation pattern to produce uncorrelated factors.

Results showed the varimax rotation with the variables and the correlation values. Variables with high correlation were considered where only nine of the thirteen listed variables had their Eigen values above one.

Table 1 Distribution of respondents by some selected personal and socio-economic characteristics

Variables	Frequency	Percentage	Mean	Standard Deviation
Age				
≤ 30	15	6.3		
31 – 40	35	14.5		
41 – 50	100	41.7		
51 – 60	76	31.7		
61 – 70	12	5.0		
> 70	2	0.8	48.0	9.
Religion				
Islam	125	52.1		
Christian	115	47.9		
Marital status				
Married	226	94.2		
Widowed	3	1.3		
Single	11	4.5		
Household size				
1 – 4	59	24.6		
5 – 8	134	55.8		
9 – 12	35	14.6		
13 – 16	6	2.5		
> 16	6	2.5	6.4	3.3
Education status				
No formal educ.	10	4.2		
Primary educ.	60	25		
Secondary educ.	82	34.2		
Tertiary educ.	88	36.7		

Source: Field survey, 2015.

The factor name ascribe to each group of variance was given based on the following criteria as used by [12], [17]:

(i)The researcher's subjective interpretation of experience from literature.

(ii)Picking synonyms of the highest loading variable on each factor

(iii)Retaining the name based on the similarity of the features of the variables contributing to each other.

Results in Table 3 show the names of the nine factor groups extracted as follows: Factor 1- Economic factor which accounted for 14.49 per cent, factor 2 – Information factor which accounted for 12.71 per cent, factor 3– Farming type factor which accounted for 10.76

per cent, factor 4 –Personal characteristics factor which accounted for 7.61per cent, factor 5 – Family related factor which accounted for 6.78 per cent, factor 6- Output factor which accounted for 5.65 per cent, factor 7 – Maintenance cost factor which accounted for 4.24 per cent, factor 8 – Accessibility factor which accounted for 3.57 per cent and Factor 9 –Management practices factor which accounted for 3.53 per cent.

Table 2. Results of varimax rotated component matrix showing correlation coefficient of highly loaded variables

Variables	**Factors**								
	1	2	3	4	5	6	7	8	9
Age		-.442			.507				
Sex							.382		-467
Marital status				.456	.453				
Religion				-.316			.432		
Household size	.407				.622				
Educational status		.615			-.309	.502			
Years of formal education		.687				.450			
Number of catfish rearing practiced			-.663		.348				
Type of fish rearing practiced			-.663		.348				
Cosmopoliteness		.576	-.518		1				
Organization membership	.399	.549		.347					
Source of information	.412	.547	.363		.455				
Total income from fish farming	.835								
Distance from residence to fish farming	.367	.317				-.381			
Distance from farm to market		.360	.324			-.322		.363	
Location of fish pond		.355	.318					.359	-320
Type of stocking practice			-.469						-315
Number of cropping		.423	-.365			-.331	-.302		
Times of feeding per day							-.592		.310
Year of experience	-.672								
Size of fish farm	.340	-.501							
Age of pond	.323	-.501							
Total production in kg	.855								
Number of fish seeds stocked	.783								
Source of loan	.316		.648						
Source of input				.315					
Benefits of fish farming				-.804		.303			
Problem of fish farming				-.804		.303			

Source: Computed from results of factor analysis, 2015

All the factors accounted for 69.4 percent of the variance of the dependent variable. This is encouraging and shows that the variables pulled together accounted for a good percentage of the factors influencing participation of fish farmers in fish farming enterprise.

Push and pull factors influencing participation in fish farming.

Results in Table 4 show the regression co-efficient of push and pull factors influencing participation in fish farming. The regression model summary showed that all the crucial factors isolated were highly correlated (R= 0.886) with participation in fish farming. The

R^2 = (0.784) shows that 78.4 per cent of the factors isolated were associated with participation of farmers in fish farming. The remaining 21.6 per cent were responsible for the uninvestigated factors not isolated in the study.

Table 3. Table showing the factor names, Eigen values and percentage contribution

Factors	Names	Eigen value	Percentage Contribution	Cumulative percentage
1.	Economic factor	4.494	14.496	14.496
2.	Educational factor	3.940	12.710	27.205
3.	Farming type	3.336	10.762	37.967
4.	Personal characteristics	2.361	7.617	45.585
5.	Family related	2.103	6.785	52.369
6.	Output factor	1.751	5.650	58.091
7.	Maintenance cost	1.315	4.243	62.262
8.	Accessibility factor	1.109	3.578	65.840
9.	Management practices	1.095	3.532	69.372

Source: Derived from the results of factor analysis, 2015.

Factor 1 (Economic factor) was positively and significantly correlated with participation (b = 0.076; p< 0.02). This shows that this factor might likely pull farmers to participate in fish farming. Economic factor included income from total production in fish farming as well as low cost on labour, input and other expenses. The more the income, low cost on labour and low input cost, the more the farmers are attracted or pulled into fish farming.

Factor 2 (Information factor): This factor was negatively significant to participation in fish farming. Information factor in this case may push farmers away from participating in fish farming. This might be true because the extension agents who were supposed to disseminate the right technological information to the fish farmers were very few in number in the State. Information is very essential for success in fish farming as stated by [3]. Fish farmers might receive information from friends and neighbours, different organisations etc. These pieces of information might not be very correct and might lead to reduced productivity when put into practice. This might discourage some farmers, thereby reducing their level of participation.

Factor 3 (Fish farm related characteristics factor): This factor was also negatively significant (b = -2.731; p < 0.05). This factor included location of fish farm, as well as size of pond. This shows that this factor might push away farmers from participating in fish farming when not appropriate. When the location of fish farm was not favourable in terms of availability of water, when the size of the pond is not big enough this might not yield expected returns thus push farmers away from participating in fish farming. Also the type of stocking practiced when not properly done will negatively influence their participation.

Factor 4 (Personal characteristics factor): This factor was positive and significantly related (b = 0.054; p < 0.05). This showed that the more favourable the personal characteristics of a farmer, the more his or her participation in fish farming. Personal characteristics in this case included age, household size and attitude of farmers. This factor might likely pull farmers to participate in fish farming.

Factor 5 (Family related factor): This factor showed a negative significant relationship (b = -1.214; p < 0.02). This showed that the factor might likely push farmers away from participating in fish farming. Family related factor included size of household. If the household size continues to increase, smallholder fish farmers might not be able to meet the family needs. Thus, reduces participation in fish farming.

Factor 6 (Educational factor): This factor was negative and significantly related to participation in fish farming (b = -1.997; p < 0.05). This factor might likely push farmers away from fish farming. This might be true because the more educated a farmer is, the more the tendency for him or her to have another occupation, thus practicing fish farming on part time bases. This might be due to his engagement in other occupational activities which would yield better income. High education of the respondents might account for the percentage practicing part time fish farming.

Factor 7 (Maintenance cost factor): This factor was positively significant to participation in fish farming (b = 0.058; p < 0.05). This factor may attract or pull farmers into fish farming.

This was evidenced when the fish farming maintenance cost was very low, thus increasing income for farmers. On the other hand, if the cost of maintenance of the fish farm was high, it might cause farmers to be pushed away from fish farming. However, scholars had reported that fish farmers were using their family members as labour on the farm, thereby reducing cost of maintaining fish farms [1]; [3]; [14] and [2].

Table 4. Showing the regression analysis of the isolated factors to identify push and pull factors influencing participation in fish farming

Factors	Unstandardized coefficient (B)	Standardized coefficient (b)	Significant coefficient
Constant	73.336		0.009
Factor 1	2.427	0.076	0.020
Factor 2	-20.287	-1.169	0.005
Factor 3	-40.365	-2.731	0.040
Factor 4	1.137	0.054	0.032
Factor 5	-34.491	-1.214	0.023
Factor 6	-54.254	-1.997	0.012
Factor 7	2.097	0.058	0.035
Factor 8	-17.151	-0.285	0.051
Factor 9	-81.299	-1.970	0.060

R = 0.886; R2 = 0.784; Adjusted R^2 = 0.138
Source: Computed from results of factor analysis, 2015.

Factor 8 (Accessibility factor): This factor was negatively significant to participation in fish farming ($b = -0.285$; $p < 0.05$). When fish farmers do not have easy access to his/her farms, the fishes may not be fed well and routine management practices may also suffer. This may lead to low production, thus serve as a push factor that might discourage fish farming, thereby become a push factor.

Factor 9 (Management practices related factor): This factor was negatively significant ($b = -1.970$, $p < 0.1$). This is at 10% level of significance. Since this factor was negatively correlated, it might serve as a push factor from participating in fish farming. [3] reported that since fish farmer extension agents were few on the field, many farmers resulted to trial and error management practices which might not be favourable to production. When productivity continues to be on the decline, farmers might be discouraged from participating in such enterprise. In addition, aged fish farmers who were tradition bound might not be familiar with modern management practices since extension agents were few thus continued to have reduced productivity which might discourage fish farmers from the enterprise, as a result be pushed away from production.

The findings revealed that only three factors (Economic, personal characteristics and maintenance cost) were pull factors while six factors (Information, fish farm characteristics, family related, educational, accessibility and management practices related) were push factors. This implies that there were more push factors than the pull factors; If this scenario should continue, the future of fish farming is bleak in Osun State in particular and Nigeria as a whole.

CONCLUSIONS

In conclusion, fish farming which is believed to be a highly productive venture has both push and pulls factors which are agitating against its success. However, the push factors are more than the pull factors in Osun State which is an indication that fish farmers are gradually been pushed out of the enterprise. If the trend should continue unchecked, few fish farmers would be left in the enterprise in the nearest future and more foreign exchange would be spent to import fish for the populace.

From this study resulted the following recommendations:

-Cost of input in fisheries should be subsidised by the government.

-More fishery extension agents should be recruited to train farmers on a regular basis.

-Fish farming should be made attractive to the youth in order to improve the number of participants in the enterprise.

-The push and pull factors should be considered when planning programmes for the fish farmers.

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PLANTAIN (MUSA ACUMINATA) VALUE CHAIN ANALYSIS IN ONDO STATE, NIGERIA

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Abstract

This paper analyzed the plantain value chain in Ondo State, Nigeria. It identified the various actors in the plantain value chain and their functions, mapped out the various segments, their linkages and the overall plantain value chain and identified the value added at each segment of the value chain. One hundred and seventy seven respondents were selected using multi-staged sampling technique and interviewed using structured questionnaire, informal interview and observation techniques to obtain the primary used. This was analyzed using functional and analysis. Result from the functional analysis, amongst other characteristics, showed that there were eight major actors or segments in the plantain value chain in Ondo State, Nigeria. They are the input suppliers, farmers, processors, marketers, consumers, transporters, cooperative societies and farmers association. This paper concluded that plantain farming is still lowly mechanised and processing has not been fully developed to explore the various value addition options available in this sector. More value can still be added to the product and more upgrading could still be done in the chain. More actors can also take advantage of the prevalence of plantain in the state. In addition, the government and private research institutions should pay attention to the training needs of the farmers so as to properly harness the comparative advantage that the state has above others states in the production of plantain.

Key words*: actors, segments, Plantain, value chain*

INTRODUCTION

Kaplinsky and Morris (2002) defined the value chain as "the full range of activities, which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), to delivery to final consumers, and final disposal after use". As shown in figure 1, the value chain can generally be separated into five stages: input supply, primary production, processing, marketing and consumption. On every stage one to several different actors can be found. The input supply considers everything from the seeds to the technical equipment that is needed for the production of the concerned product. The primary production meaning all activities (sawing, fertilizing, and harvesting) needed to produce raw material like grain or vegetables follows input supply. The next stage in the process is trade and marketing. The processed products have to be transferred to the places of demand and distributed and sold there. Marketing can be done directly by the producers or processors, but the higher the amount and quality of the traded goods the higher are the requirements about marketing. The last stage is consumption of a good. Even though the consumer does neither participate in the production process nor add value to the product, he is part of the chain as in most cases the consumer is the driving power of the whole process. Therefore consumer demand is the determining factor for the kind, amount and quality of a product. [11]

Plantains (*Musa acuminata*) is an important food crop in the humid forest and mid-altitude zones of sub-saharan Africa. Plantain is one of the major staple food in Nigeria, it had the highest percentage increase in output over years 1999 to 2003 - implying the existence of market potential and increase production in the country. Plantain has become a key source of revenue as they are not only traded within the country, but also exported to other continents including Europe. The status change from food to food/cash crop enhances its importance [9]. In terms of gross value of production, plantain is one of the most important fruits in developing world [1]. Plantain yields,

however, have been seriously declining, threatening food security and the livelihoods of millions of subsistence farmers and their families in the country. Production needs to be intensified to realize value-added chains, while sustaining the natural resource base.

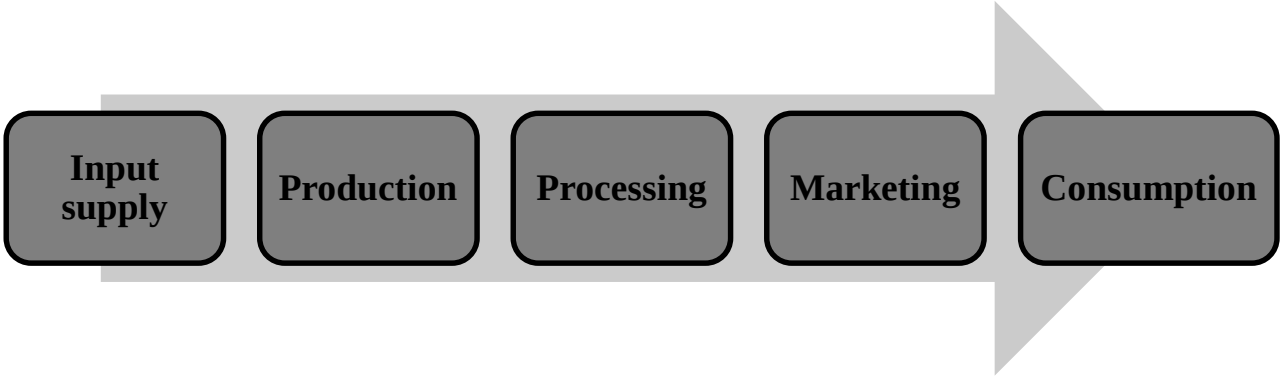

Fig. 1. Five stages of a value chain
Source: [1

From time immemorial, agricultural development in Nigeria has always been hampered by lack of efficient and viable agro-processing and storage facilities resulting into post-harvest losses, particularly in the plantain value chain. The annual post-harvest losses recorded by the Nigerian farmers constitute greater threat to food security, socio-economic living conditions of the populace and by extension sustainable growth and development of the Nigerian economy especially in the face of the global financial crisis bedevilling national economies. Post-harvest losses have been a constraining factor in plantain production such that increase in yield brought about by advances in technologies through research did not make any significant impact on the economy of small scale farmers. This is why analysis and strengthening of the agricultural value chain become imperative.

Analysis of the plantain value chain in Nigeria, as contained in this paper, looks at the whole process of effective utilization of resources in the plantain value chain to create a competitive advantage that would provide a lower cost and higher profit. This study is important because, as opined by Sanusi (2011), "with value addition (in the plantain value chain), post-harvest losses will be reduced to the barest minimum, farmers can earn more income from their endeavor and food security can be better enhanced as it removes the effect of seasonality in the food supply chain and promote export". There is no doubt that backward and forward linkages of plantain plantation would ensure steady supply of plantain fruits which would further stimulate the establishment of plantain processing industries. This would open opportunities for businessmen in marketing plantain products. These activities result in new commercial ventures translating into other new demand and savings which are the key factors in economic growth [5].

MATERIALS AND METHODS

The study area is Ondo State. Ondo State is located in the South-western Zone of Nigeria. The State lies between longitudes $4^{0}30^{1}$ and 6^{0} East of the Greenwich Meridian, 5^{0} 45^{1} and 8^{0} 15^{1} North of the Equator [12]. The respondents for this study were various categories of actors in the plantain value chain. A multi-staged sampling technique was used to select these respondents from six villages which were purposively selected due to the prevalence of plantain production. They are Ogbese (Akure North), Akponmu (Akure South), Idanre (Idanre), Laje (Ondo west), Odigbo (Odigbo) and Ode Irele (Irele) respectively. Seven farmers were selected from each of these communities, making a total of 42 farmers in all.

Also, six major commercial nerve centers were purposively selected. They are Akure, Ondo, Owo, Ikare, Okitipupa and Ore. One input supplier, 5 processors, 5 consumers and 1 exporter each were interviewed from each

local government giving a total of 5 input suppliers, 30 processors, 30 consumers and 5 exporters. Furthermore, three major produce market where plantain is predominantly sold were selected namely, Ogbese, Emure-Ile and Owena Markets respectively. Fifteen (15) marketers were interviewed from each of the produce market making a total of 45 marketers interviewed. Primary data were collected with the aid of well-structured questionnaire, interview format and observations. Secondary data were collected from the Ministry of Agriculture, Ministry of Commerce and Industry, Agric Input Supply Agency (AISA) and from the internet. Functional analysis using descriptive statistical tools such as tables, charts and percentages were used to analyse data collected. Functional analysis was used to identify, upstream, the principal providers of inputs and services which feed into production. The roles and functions of these agents were identified. [4]. The functional analysis table shows the principal functions in the chain, the agents, (or aspects of agents) carrying out these functions and the principal product of the chain (the various forms into which it is transformed throughout the chain).

RESULTS AND DISCUSSIONS

There were several actors in the plantain value chain in Ondo State, Nigeria. The various segments and actors are discussed below.

Input Supply Segment

The input suppliers in the plantain value chain were involved in the lease and sale of farm machineries and implements, fertilizers, pesticides, herbicides and fungicides to the plantain farmer. They also met the training needs of plantain farmers in the State in terms of the use of appropriate agrochemicals and improved suckers varieties.

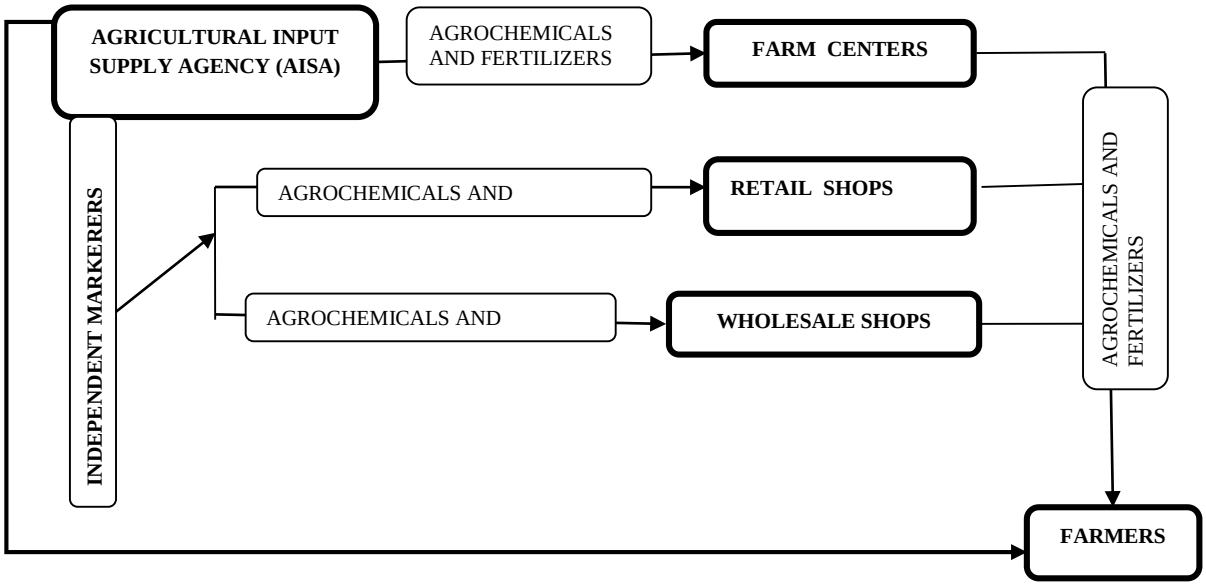

Fig. 2. Value chain diagram showing activities in the input segment of the plantain value chain

Agrochemicals were either supplied by wholesalers and retailers in the open market at the prevailing market rate or by the State Government through the Agricultural Input Supply Company (AISC), which has its head office in Akure, the State's capital. The latter supplied these inputs at prices subsidized by 40 - 50% but faced the challenge of inadequate supply due to lack of finance. Except for individual efforts by few farmers, sucker multiplication was not done in the state. Farmers rather procured suckers from existing farms. Information delivery from research institutes to farmers was very poor and at its lowest ebb as private individuals involved in input supply saw it as a profit making business and the government arm (AISC) saddled with this responsibility was short of funds for operation.

The map of this segment of the value chain is shown in Fig.2.

Production Segment

Farmers carried out land preparation for planting of the suckers, farm maintenance and management and harvesting of the plantain bunches when they matured. They were also involved in processing (for sale and household consumption) and marketing of plantain.Although both men and women produced plantain in Ondo State, the enterprise was highly male – dominated as 98.0% of the pooled farmers was made up of men. Similarly, bulk (93.0%) of the farmers was married. This probably suggested that family labour was an important input in the enterprise. Thirty one (31.0%) per cent of the farmers had secondary education while 29.0% had tertiary education. Farmers with tertiary education took to plantain farming after schooling as a means to make ends meet while they searched for other better paying white collar jobs. Those with secondary education were older men who either farmed as their major occupation and other sources of income to support it. This generation of older men would soon pass on, leaving the younger generation who only saw farming as a last resort and as a way to make ends meet rather than as a business and gainful means of employment.

Results showed that 26.2% of respondents had their farm sizes between 0.5 to 0.99 hectares. Mean land area cultivated per farmer was 2.81 ha. This revealed that land area cultivated in plantain production in Ondo State was still low. The cocoa/plantain intercrop and the bush plantain farming systems was practiced by 45.0% of farmers interviewed respectively. About thirty five (34.97) hectares of the total land area cultivated was under the plantain / cocoa intercrop system while 74.05 hectares was cultivated under the bush plantain farming system. The farm sizes and production systems of plantain farmers in Ondo State had a lot to say about the attitude of farmers to plantain farming and the reason for the observed low yield in plantain farms across the State. The implication of this was that there was no focus on the cultivation of plantain as a cash crop with great export value. Plantain was only cultivated at subsistence level or at best to generate income for the farmer's family notwithstanding the fact that the state had great potentials, in terms of climate and soil texture, for the production of this crop. Results also showed that 50.0 % of farmers had their houses from 6km and above away from the farm. Proximity of farm to market lessened the cost of transportation and losses through inappropriate loading in the bus while long distance resulted in product loss, low profit and value added.

Respondents who cultivated plantains for the dual purpose of consumption and sale had the largest proportion (83.3%) of the pooled farmers as well as the highest hectarage of 80.5 ha.

On the other hand, farmers who cultivated the crop for consumption purpose alone were fewest (2.4%) and operated an almost negligible hectarage of 0.8ha. it is interesting to observe that although the farmer who planted plantain solely for commercial purpose accounted for approximately 14.0% of total respondents, they operated a land area of approximately 35 ha. This indicated that commercialization of crop production made the farmers have relatively large farm sizes. About sixty percent (59.5%) of the farmers interviewed sold suckers to other farmers either in bits or as a business. 40.5% of the farmers interviewed didn't sell suckers. They either gave them out as gifts or used it to expand their farms. The sale of suckers was also an additional source of income for the farmer's family. Source of capital was an important determinant of the size of farm holdings and whether the farm was subsistence or commercial. Result showed that 76.1% of the farmers interviewed farm with their own capital alone. This further explained the subsistent nature of plantain farming in Ondo state. Inadequate access to credit, high interest rate and fragmentation of farm holdings accounted for this. Also, 76% of the farmers interviewed had no access to formal credit at all while only 23.8% have access to formal credit for plantain farming. The reason attributed to this by some of the farmers was that the farmer's union, which loans money to its members and liaise with the government to make credit available to its members, no longer existed. Also, because farmers did not have the

required collateral security, it was extremely difficult, if not impossible, to get loans from commercial banks.

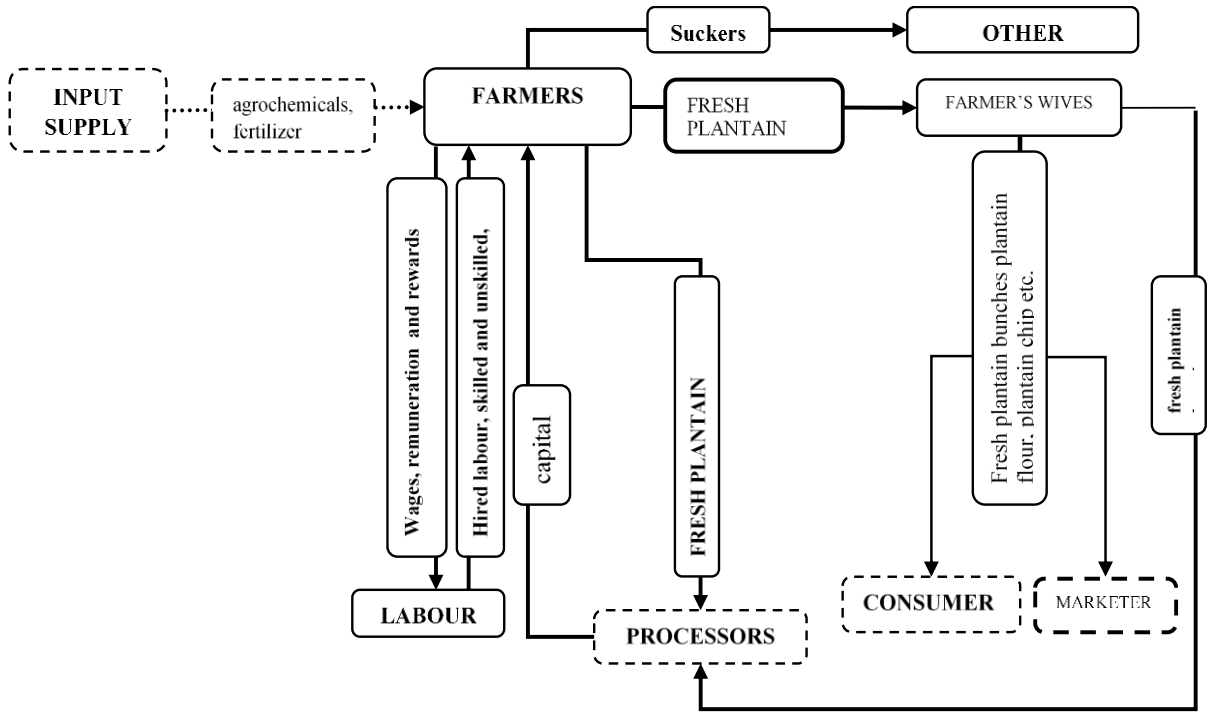

Fig. 3. Value chain showing activities in the farmer's segment of the plantain value chain

Processing Segment

Processors were involved majorly in adding form value to plantain by transforming it into various products. Majority of these processors (80.0%) were fried plantain chips processors. This was because plantain chips is a major snack consumed and there was high demand for it. Small scale processors of plantain processed between $1^1/_2$ to 4 (four) bunches every day. Processing was often manual and plantain was sourced from their own farm, neighbouring farms or from neighbourhood markets. Other sources of income for small scale processors were farming and sale of provisions. Seasonality in plantain supply and the consequent rise in price during the off season had great impact on several small scale processors survival and their stay in the value chain. Large scale processors of plantain chips processed between 40 to 50 bunches of plantain every day. They visited local produce markets or made arrangement with farmers such that they harvested on the days they had been pre – informed of their coming to purchase plantain. Plantain chips made by large scale processors was often sliced in round flat or diced, fried at designated factories, and packaged in 80g packets or packaged in a bigger pack of four dozens of 80 g each. It was then distributed by the processors (to various parts of the state or by various other distributors) or wholesalers (to markets and supermarkets). Peeling of plantain was manual with hired labour while frying and packaging was partly manual and industrial.

Small scale processing of plantain into dried chips and subsequently plantain flour was done by consumers and farmers, either for household consumption to avoid waste of unsold harvest. However, the commercial nerve center for large scale industrial processing of plantain into dry chips and subsequent packaging in flour form was the State capital, Akure. Small scale processors of plantain flour processed one or two bunches into flour as the need arose but large scale processors had a daily plant capacity of 45 – 100 bunches of plantain. Plantain flour was packed after processing into 1 and 2 kg bags and delivered to sales outlets. The skilled

labour force of large scale processors ranged from 1 -3 while the unskilled labour could be 4 or more. Seasonality of plantain during the year affected the price of plantain flour as scarcity caused an increase in its price while the rainy season reduced demand such that more effort had to be put into advertisement. Roasted Plantain, popularly known as "*Boli*", is a common snack made from plantain and consumed all. It is a small scale processing business where an average of 1 – 2 bunches, of varying sizes , was processed every day, depending on the season. During the dry season (when plantain was scarce, expensive and gave way to roasted corn and yam respectively at the onset of their seasons), price of roasted plantain increased for some processors, while for others the business stopped. Size of labour force at most was two (processor and a family member to help) and the business was often accompanied with the sale of fried groundnut, which a common accompaniment for roasted plantain.

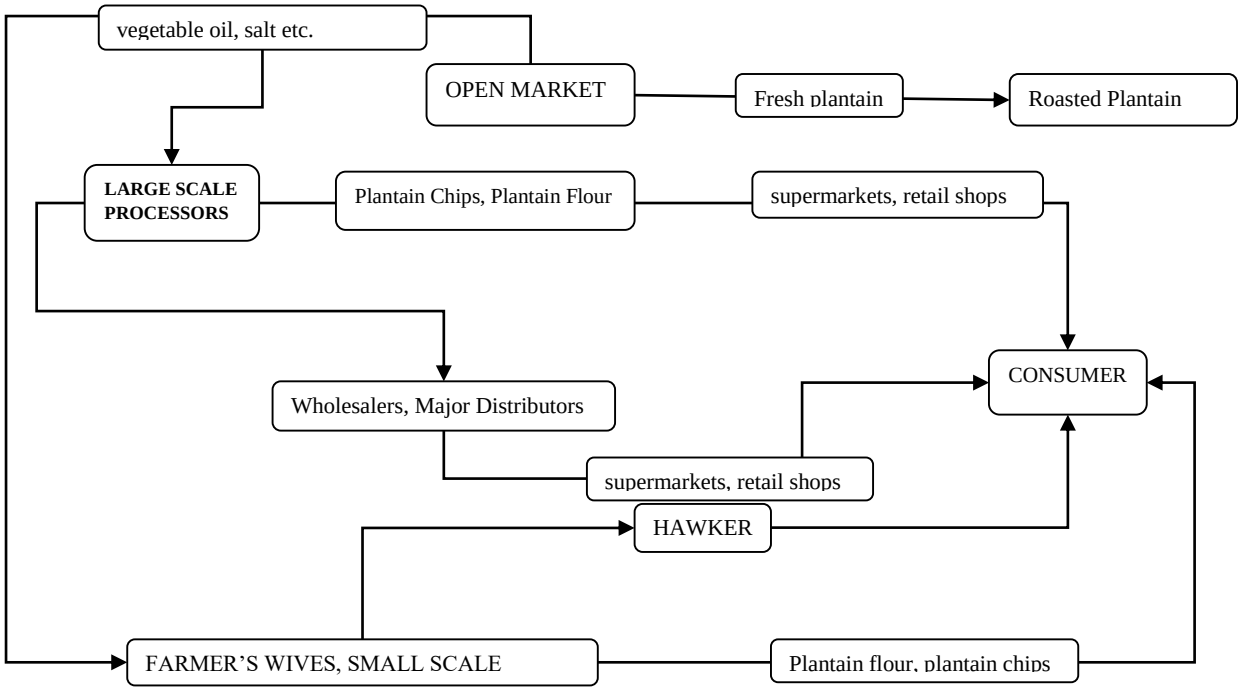

Fig 4. Processor's segment of the plantain value chain.

Marketing Segment

Fifty five (55) per cent of the marketers interviewed were retailers of plantain and its products. There was high concentration of marketers as the product moved from the processor to the final consumers. Wholesalers and major distributors of fresh plantain got their supply directly from the farmers or from produce markets on various market days while wholesalers or major distributors of plantain chips and flour got their supply directly from the processors. Wholesalers of fresh plantain sold in dozens of bunches while the retailers or the roadside marketers who served as the final link to the consumer sold in bunches or in group of disjointed sticks of plantain which sold for ₦100 and ₦ 200. About sixty three (62.5) per cent of the marketers interviewed sold fresh plantain. This high percentage might have been due to the fact that fresh plantain was readily available much more than any other product and required no huge capital base compared to processing or because it could be sold in its ripe and unripe form as desired by the consumers. In produce markets, plantain chips (dried) and plantain flour was often sold alongside fresh plantain as wholesalers and retailers sought to avoid loss from incomplete sale of produce.

The use of family labour was not common in marketing of plantain and its products as only 30.0% used family labour at all. Often marketers of plantain and its products hired labour they needed. The use of family labour

was common with road side marketers, who are small scale producers and marketers of plantain chips and roasted plantain. Fifty (50) percent of marketers preferred to purchase the fresh plantain and plantain flour they sold from the produce markets and from farm settlements so as to take advantage of the lower price and thus a higher profit margin. This was only possible for retailers and roadside marketers who had enough capital base in the business. Road side marketers and retailer who could not afford to get fresh plantain from produce markets and farm settlements opted for wholesalers in the neighbourhood markets. These made less margin than other marketers. Marketers of plantain chips (fried) and "*Dodo*" also preferred to buy directly from processors, as this increased their profit margin. Most (85%) marketers sold within the state, especially within their towns and local government areas. Only wholesalers and major distributors marketed across states of the nation such as Rivers, Kwara and the Federal Capital Territory.

The distribution of marketers according to the frequency of marketing showed that 61.0% of respondents marketed every day. This was because in urban areas, there were more markets that operated daily than in rural areas where marketing was done every five days.

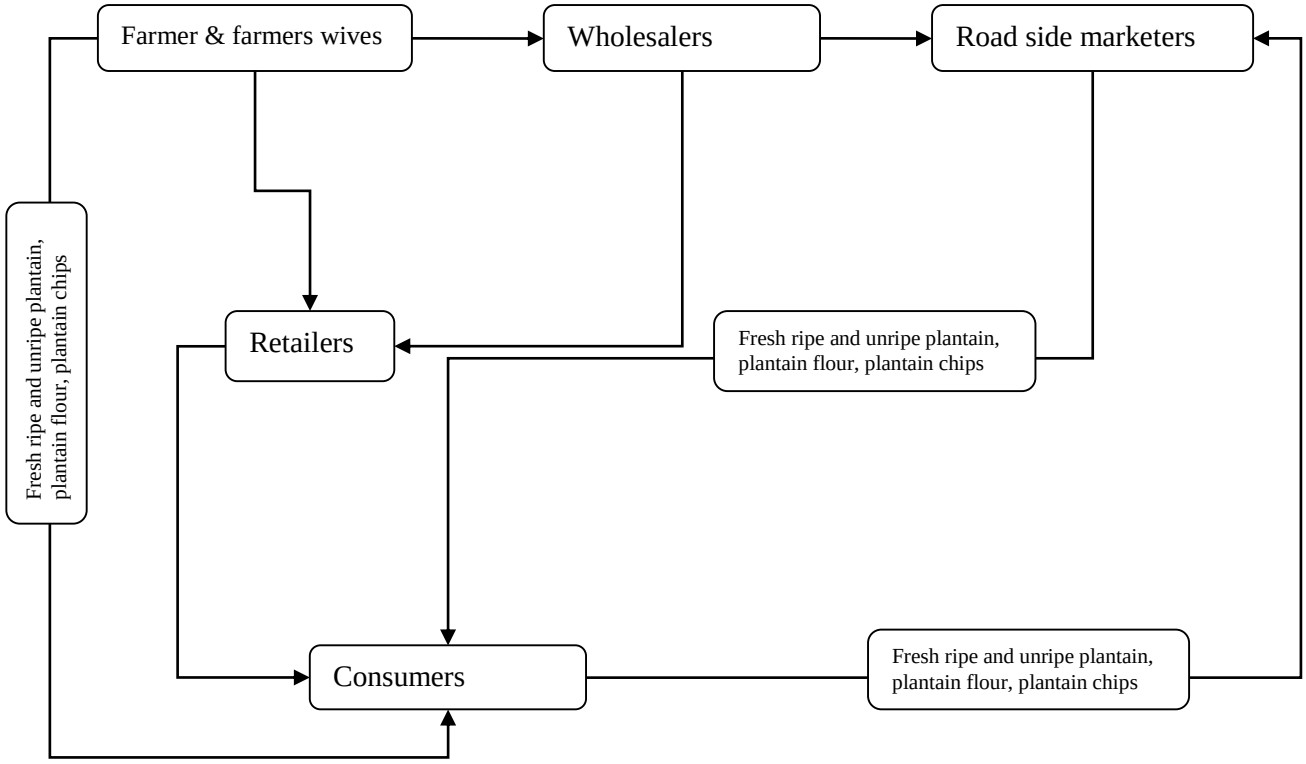

Fig. 5. Value chain diagram showing the marketing segment of the overall plantain value chain

Most retailers of plantain marketed six days in a week or every day of the week. Peak and off peak seasons existed for all marketers of plantain and its products. However, the timing and effect varied for each product. Fresh plantain and plantain flour marketers experienced off season during the dry season and at the onset of the rainy season. This led to an increase in price and scarcity of the product. On season occurred when the rainy season had set out well. There was often a glut in the supply of fresh plantain and a reduction in the price of plantain flour. Plantain chips marketers often did not feel the effect of this change in season. Rather, proximity to higher institutions brought about seasonality in sales for plantain chips marketers. Several other factors that caused seasonality in the sale of

plantain and its products were the advent of maize and yam season and muslim fasting season.

Tax was often paid daily, monthly or yearly and most of the respondents interviewed belonged to trade unions to which they also paid dues yearly. Most of the fresh plantain and plantain flour sellers also sold other farm produce like fruits and vegetables, pepper, maize etc. while plantain chips sale was usually accompanied with the sale of provisions.

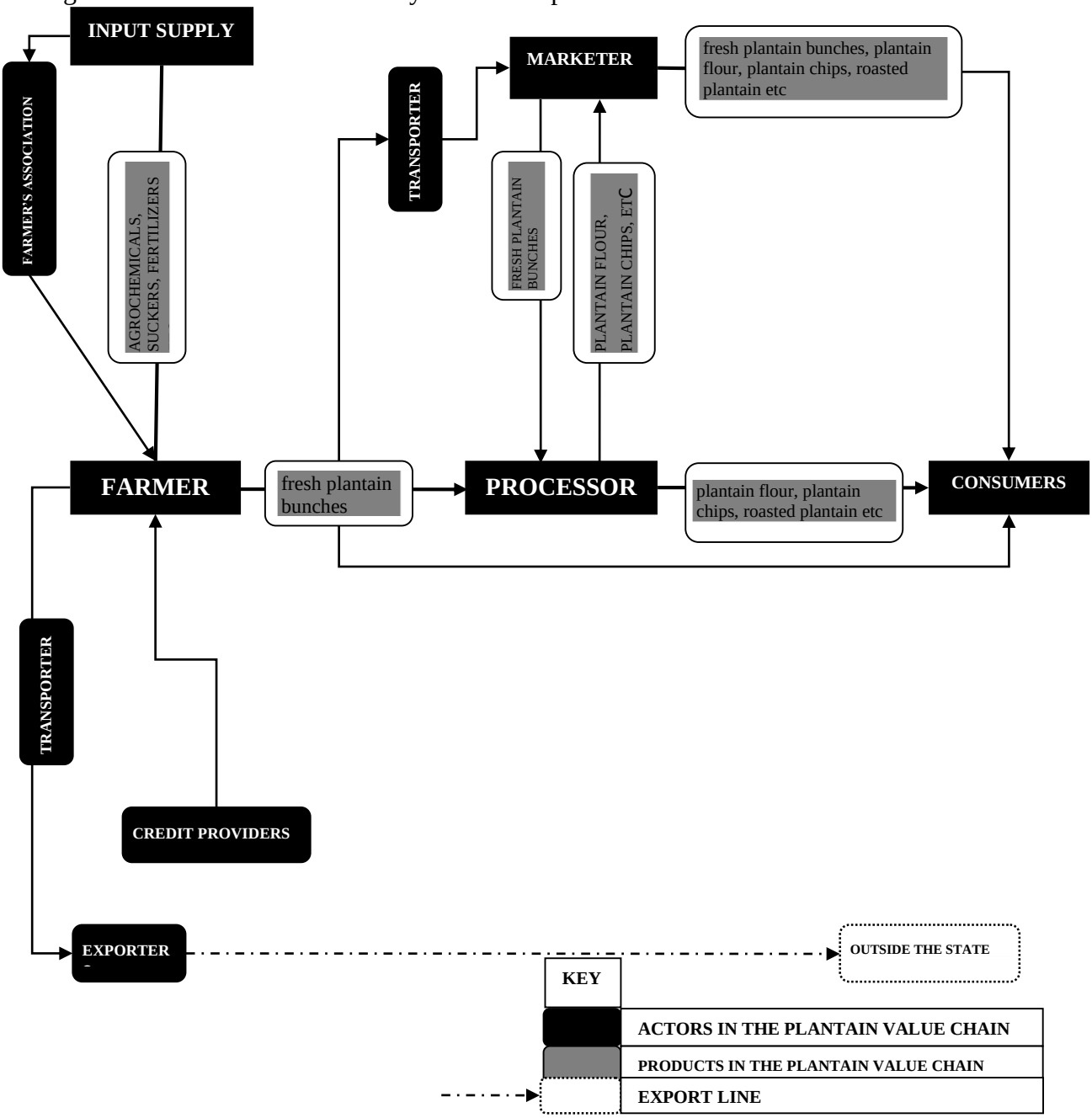

Fig 6. Overall plantain value chain in Ondo Stat

Consumers Segment

Plantain and its products was an important food in most of the families of respondents interviewed, whether male or female. It was also an important snack for students and individuals at all levels of education and marital status (whether single or married). The frequency of consumption was however different for each individual. Plantain was eaten more often by families in the rural areas as a supplement for yam when yam is scarce. Quantity consumed by respondents

interviewed varied from 5 sticks per month to 4 bunches per month, depending on the family size. Although other varieties were consumed, the AAB group was mostly preferred because of its taste. Most consumers sourced plantain and its products from the market, retail shops and roadside marketers but some also had backyard farms of plantain. Seasonality often affected the demand for plantain because of the increase in price and scarcity that marks the off season

Other actors in the Plantain value chain

Transporters

Transporters are an important part of the plantain value chain as they were found in each segment of the plantain value chain. They helped farmers move plantain from their farms to the produce market each market day and also helped collectors of plantain who exported it to other states. Seasonality of plantain affected frequency of plying routes to transport plantain. During the on season some transporters plied their route twice to transport plantain while during the off season they only plied it once.

Cost of transportation also increased during the on season as the quantity transported increased. Appendix figures 10a and 10b shows the various means of transportation used by plantain transporters.

Table 1 shows the functional analysis of all actors in the plantain value chain.

Table 1. Functional analysis of the plantain value chain in Ondo State

S/n	Principal functions	Subdivisions	Agents	Principal products	Utility or value added
1.	Input supply	Distribution and marketing, training of farmers	Agric Input Supply Agency (AISA), Akure, farm centres (govt. owned)	Agrochemicals and fertilizers, simple farm implements such as knapsack sprayer etc. (subsidized)	Place value
		Distribution and marketing	Independent input suppliers and public shops	Agrochemicals and fertilizers, simple farm implements such as knapsack sprayer etc. (un-subsidized)	
		Lease	Equipment dealers, state and local government.	Tractors, ploughs, harrows etc.	
2.	On- farm production	Land preparation	Hired labour or farm machineries like tractors etc.	Plantation, plantain suckers and bunches, sheaths, petioles and leaves	Form value
		Planting	Farmer, hired labour, male members of farmer's household		
		Maintenance / management	Farmers/ hired labour		
		Harvesting	Farmers/ hired labour and family labour (farmer's wives and children)		
3.	Post-harvest handling	Transporting	Transporters, processors, consumers.	Fresh plain bunches, either delivered to processors, consumers or marketers	Time, price and place value
		Marketing	Wholesalers, retailers, roadside marketers, farmers' wives		
		Exporting	Exporters / major distributors		
4.	Product transformation	Processing	Plantain flour and chips processors (both industrial and small scale processors), consumers, farmers' wives, small scale eatery, road side marketers	Plantain flour, plantain chips, boiled plantain, plantain porridge, "ekuru", roasted plantain	Form value
5.	Product trading	Transportation	Wholesalers, retailers, major distributors, retail outlets and supermarkets, hawkers	Plantain flour, plantain chips, boiled plantain, plantain porridge, "ekuru", roasted plantain	Time, price and place value
		Marketing			

"Exporters" (Inter – State Marketers)

Plantain**,** as earlier said, was exported to other states of the federation by exporters who come from these other states, after making previous arrangement with the various farmers. They made use of transporters to gather the plantain from various farms where they meet the farmers and buy the plantain stock that they may have. In Ore and Akure, there are plantain depots where these exporters gathered the plantain they have collected in heaps and got for either a bus or 9 11 truck to carry them to their destination. Each heap of plantain

contained 18 – 22 dozens of plantain bunches. Exporters also paid tax depending on the load. Farmers who had the means also exported plantain to other states to sell. Exporters came from Lagos, Delta, Abuja, Kwara, Edo, Oyo etc.

Credit Providers

Credit providers are formal institutions who offered credit to every segment of the plantain value chain. Credit institutions were not active in the plantain value chain. This was due to the risky nature of farming in general and plantain farming in particular. This might also be due thenlack of collateral and small business holdings. The only source of credit identified in one of the 6 local governments where respondents were interviewed was a revolving loan given to farmers by the Agric Development Bank (an international bank), through the government at 9% per annum.

Farmer's Association

Farmer's association existed only in one (1) e local governments. They met twice in a month and served as a medium to interact with and train farmers on good agronomic practices. No attention was given to plantain farmers in terms of their training needs.

Cooperative Societies

Cooperative societies that provide farmer's credit needs also existed sparingly. Difficulty in accessing credit made most farmers not to patronize them.

CONCLUSIONS

This paper examined the plantain value chain in Ondo State, Nigeria. Primary and secondary data were collected using a multistage sampling technique. Functional analysis was done on the data collected. Result from the functional analysis showed that there are eight major actors or segments in the plantain value chain in Ondo State, Nigeria. They are the input suppliers, farmers, processors, marketers, consumers, transporters, cooperative societies and farmers association. In the input supply segment, agrochemicals were either supplied by wholesalers and retailers in the open market at the prevailing market rate or by the State Government through the Agricultural Input Supply Company, which has its head office in Akure, the State's capital. The latter supplied these inputs at about 40 – 50.0% subsidized price but faced the challenge of inadequate supply due to lack of finance. In the farmer's segment, functional analysis revealed that plantain production is male dominated in Ondo State and most plantain farmers are married.

It was concluded that plantain farming is still lowly mechanised and processing has not been fully developed to explore the various value addition options available in this sector. More value can still be added and more upgrading could still be done. More actors can also take advantage of the prevalence of plantain in the state.

Based on the findings of this study, the following recommendations were made:

(i)The government and private research institutions should pay attention to the training needs of the farmers so as to properly harness the advantage that the state has above others in the production of plantain;

(ii)Financial institutions and other avenues through which credit can be offered to farmers and small scale processors should be empowered and enlightened;

(iii)Government and non-governmental organizations should embark upon the commercialization of the processing and marketing segments of the plantain value chain and technological upgrading of the processing segment.

ACKNOWLEDGMENTS

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ASSESSMENT OF UTILISATION OF SOIL MANAGEMENT PRACTICES AMONG ARABLE CROP FARMERS IN OGUN STATE: IMPLICATION FOR SUSTAINABLE AGRICULTURE IN NIGERIA

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Abstract

The study assessed utilization of soil management practices among arable crop farmers in Ogun State. Specifically, it described the socio-economic characteristics of arable crop farmers; identified the soil management practices (SMPs) prevailing in the study area; determined the crop yield and respondents' level of utilization and identified problems associated with their utilization. A multi-stage sampling procedure was used to select 110 farmers from selected six functional fadama sites in Ogun State. Results showed that majority (92.7% and 79.1 %) of the respondents were male and married respectively with mean age of 37.5 years. Zero tillage, mulching, ridging and cover cropping were the major SMPs identified by the respondents. Among SPMs identified, mulching (mean = 2.76), ridging (mean = 2.41), fertilizer application (mean = 2.26), zero tillage (mean = 2.25) and cover cropping (mean 2.25) were the mainly utilized while majority (69.1%) utilised SMPs at moderate level. Further results showed that inadequate supply of fertilizer (mean = 1.78) and high cost labour (mean = 1.69) were identified as the major constraints to usage of the sustainable soil management practices. Age (r = 0.20); farming experience (r= 0.451) and crop yield (r = 0.223) had significantly relationship with the respondents' utilisation of SMPs. The study concluded that the level of use of soil management practices had direct effect on yield of crops and sustainability of soil used in Ogun state, Nigeria.

Key words**:** *sustainability, yield, soil management practices, arable crops*

INTRODUCTION

Good soil management is a key to sustainable farming practices. Generally, there is close link between good and profitable farming; improving/maintaining soil fertility and good environmental management. [13] opined that what a farmer can achieve is highly dependent on good soil management and climate of the area. It is clear that good soil management can drastically reduce the value of land for agriculture and lead to environmental problems which invariably results into soil degradation and this is termed unsustainable use of land. It has ascertained that about 2,145 million hectares out of 2,900 million hectares total land area in Africa, 72% are problem soils with different production constraints (soil acidity, steeply sloping soils, low fertility, shallow and stony soils, saline and poorly drained soils [10]. This shows that the level of sustainability of land management practices in Africa. Sustainable land management has been defined as the use of appropriate soil management practices that enables land users to maximize the economic and social benefits from the land while maintaining or enhancing the ecological support functions of the land resources [10].
Human activities have either direct or indirect effects on the sustainability of natural resources like land, thereby threatening its continuous productivity. This consequently, affects agricultural production. Also, ever increasing population in the developing countries which result in continually rising of demand for agricultural produce is contributing to the intensification of land use and adoption of technologies that would enhance constant

supply of agricultural produce. Attempt by man to meet his food, wood and other resources requirements have destroyed the biodiversity and in order to expand agriculture and forestry, over cropping of some crops has resulted more often, to adoption of appropriate technologies and farm practices which further worsen sustainable land use among farmers. Loss of biodiversity, climate change and land degradation due to population pressure in developing countries, poverty and poor performance of extensive agriculture are such factors that make farmers to have problems in sustainable production activities [19]. Soil is therefore managed in order to conserves agricultural land, biodiversity and food security for the country. Sustaining soil fertility and food security cannot be separated. In addition, it is sometimes noted that some farmers have no or little knowledge about soil management, hence they abandon certain farmland when found unproductive due to some factors which can be controlled provided they are well equipped with knowledge on soil fertility. [13] opined that if some of the currently used soil management practices are continued, groundwater and food contamination will increase and jeopardize the sustainability of the current land use systems

Sustaining soil fertility has become a major issue for agricultural research and development in rural areas of Africa [22]. Sustaining soil fertility is an essential component in achieving food and livelihood security for the present and future generations [11]. In the past, most research efforts focused on trials to determine the appropriate amount and type of fertilizer needed to obtain the best yields for particular soil types and specific agro-ecological locations. This approach emphasized the use of external inputs and expensive technologies, and often disregarded farmers' knowledge and the resources at their disposal. Since then, research has gradually shifted towards an approach based on Integrated Soil Fertility Management (ISFM), which combines various existing soil fertility management techniques with external inputs. This combination is based on a thorough scientific understanding of the underlying biological processes of ISFM and aims to promote options that make the best of locally available inputs, and that are tailored to suit local agro-ecological conditions, and farmers' resources and interests.

The present soil fertility management practices at the farm level are not sustainable. However, there are possibilities to improve farmers' soil fertility management practices, for instance, it is necessary to recommend soil and/or plant testing to adjust fertilizer and/or manure application rates to crops to reduce excessive nutrient input, and to adopt appropriate decision support systems for efficient and sustainable management of production resources. Many development projects and policies have collapsed because of the failure to understand local knowledge and how this influences the way farmers manage natural resources [20]. Less attention has been paid to studying and understanding how soil fertility is perceived and managed at farm level, and how various physical, economic and socio-cultural factors interact. Hence, the need to study the current soil management practices crop farmers in Ogun State. The study thus, assessed the level of utilization of sustainable soil management practices among arable crop farmers in Ogun State, Nigeria.

Objectives of the study

The main objective of the study was to assess the soil management practices used by vegetable farmers in Yewa North Local Government Area (LGA) of Ogun State. The specific objectives were to

(1)describe socio-economic characteristics of respondents;

(2)identify soil management practices prevailing in study area;

(3)determine the crop yield and level of utilisation of soil management practices; and

(4)identify constraints associated with utilization of soil management practices in the study area.

Hypotheses of the study

The hypotheses were set in null form.

$H0_1$: There is no significant relationship between utilization of soil management practices and socio-economic characteristics of the respondents.

$H0_2$: There is no significant relationship between utilization of soil management practices and crop yield of the respondents

Theoretical framework

The study was based on sustainability theory by Scoones [21]. The theory assumed that sustainability could either be strong or weak. A 'strong sustainability' prioritised the preservation of ecosystem while a 'weak sustainability' disregards specific obligations to sustain any particular good practices. In terms of farmland, for example, a strong view might argue for protection, even if it requires foregoing development that would increase opportunities for future generations.

A weak view would take into account the various immediate benefits of soil management practices without making attempt to measure the future value of those benefits against the values created by development.

Development in this regard is mainly in economic gain (profit).

The two views loosely correspond to ecocentric (ecologically centered) and anthropocentric (human-centered) positions in environmental ethics, but not perfectly.

The ecocentric view requires that moral decisions take into account the good of ecological integrity for its own sake, as opposed to exclusively considering human interests.

In this case, farmers productivity may be paramount to them. But a strong sustainability view could be held from an anthropocentric perspective by arguing that human systems depend on rich biodiversity or that human dignity requires access to these natural resources like soil.

However, a weak view would not necessarily approve the expiration of natural resources, even with the prospect of lucrative profit. Thus, sustainability theory becomes very important to this study as it reveals that sustainable soil management practices are based on farmers decisions and farmers decisions are primarily based on the economic gain they intend to have from their farmland.

MATERIALS AND METHODS

The study area

The study was carried out in Yewa North LGA in the West of Ogun State, Nigeria, bordering the Republic of Benin. Its headquarters is Ayetoro town at longitude 7°14'00"N and latitude 3° 02'00" E in the north-east of the Area. It has an area of 2,087km^2 and a population of 181,826 [15].The climate is sub-humid tropical with an average annual rainfall of 1,909.30 mm. It is located in the Derived savanna agro ecological zone. Ayetoro lies between 90 and 120 metres above sea-level. The entire surface is made up of an undulating surface drained mainly by Rori and Ayinbo Rivers. The landform is that of eroded pediment plain with well-incised valleys forming a trellis pattern. The major occupation among the inhabitants of the area is farming particularly arable crop farming.

Sampling procedure and sample size

Two stage sampling techniques were adopted for the selection of respondents. Yewa LGA comprises of ten (10) Fadama sites where vegetables are primarily grown. However, only six of these sites were functional. Purposively, the six (6) functional sites were selected. The total number of registered vegetable farmers in each of the sites was 90, 70, 110, 190, 40 and 50 respectively. Proportionate sampling procedure was used to select 20% of the vegetable farmers in each of the functional Fadama sites to get 18, 14, 22, 38, 8 and 10, thus a total of 110 farmers were sampled for the study. Quantitative data were collected using well-structured and validated interview schedule. The data were summarized using descriptive statistics such as frequency count, percentages, mean and standard deviation, while Chi-Square and Correlation analyses were inferential statistics were used in the study to draw inferences on the hypotheses.

Measurement of variables

The dependent variable for the study was conceptualised as utilization of soil management practice. It was measured by calculating total utilisation score of each respondent from ten soil management practices utilized. The reaction was against a 4-point Likert type scale of utilisation ranging from Always utilized (3 points), Occasionally utilized (2 points), Rarely utilised (1 point), and Never utilised (0 point) as used by [3]. The

maximum score for each respondent was 30 while the minimum score for each respondent was zero. The total score per respondent was further classified into three categories as follows: low, moderate and high level of adoption using mean of total adoption score plus/minus standard deviation. Crop yield was measured by asking the respondent to rate their crop yield in the last three years of using SMPs. The reaction was against 4-point Likert-like scale ranging from very high (4 points), high (3 points) average (2 points) and low (1 point).

RESULTS AND DISCUSSIONS

Socio-economic characteristics of respondents

Results in Table 1 show majority (92.7%) of the respondents were male with very (7.3%) female. The findings showed that male dominate arable crop production in the study area. This is expected because traditionally farming work is known to be male gender specific due to drudgery and risk involved in it. Also, the study revealed that about two-third (61.2%) were within the age bracket of 20-40 years with the mean age of 37.5 years. This implies that majority of the respondents were in their active and productive age during which they could withstand the rigour required for farming operations. This result is in line with the findings of [16]; [12] who both asserted that people in their active ages tend to perform their tasks effectively and efficiently as they painstakingly endure the stress and rigours of exerting and fatigue laden assignments. The ecological implication is that the respondents had potential to adopt and utilise new methods of soil management practices which are sustainable as they were expected to be less risk averted. Moreso, majority (79.1%) were married. This implies that married people were more involved in arable crop production. This could be due to the fact that this category of people have more responsibilties than the unmarried, so the need to involve in income generating activities becomes necessary so as to meet up with the challenges of meeting the family responsibilities. In addition, majority (52.7%) were Muslims, 40.9 percent were Christians and only very few (6.4%) were traditional worshipers. This implies that Christianity and Islam were the dominant religions in the study area. About (59.1%) had farming experience of 11-15 years with the mean farming experience of 12.5 years. This means that majority of the respondents were experienced farmers and this could influence their utilization of sustainable soil management practices.

Table 1. Distribution of respondent by some selected socio-economic characteristics of respondents (n = 110)

Variable	Frequency	Percentage mean
Age (years)		
20-30	31	28.3 37.5
31-40	36	32.9
41-50	24	20.8
51-60	7	4.5
Sex		
Male	102	92.7
Female	8	7.3
Marital status		
Single	13	11.8
Married	84	79.1
Divorced	10	9.1
Religion		
Christianity	45	40.9
Islam	58	52.7
Traditionalist	7	6.4
Years of farming experience		
1 – 5	6	5.5
6 – 10	19	17.3 12.5
11 – 15	65	59.1
Above 15	20	18.1
Other occupation aside farming		
None	74	67.3
Civil service	18	16.4
Trading	10	9.1
Student	1	0.9
Monthly income		
₦ 2,000 – ₦ 10,000	20	18.2
₦ 10,100 - ₦20,000	35	31.8 ₦ 8,536.26
₦20,100 - ₦30,000	40	36.4
Above ₦30,000	15	13.6

Source: Field survey, 2015

Furthermore, majority (71.8%) of the respondents had attained one form of formal education or the other while about 28.2 percent had no formal education. This implies that majority of them were literate which could assist them to be more enlightened in utilization of innovations than illiterates. This result however, is in tandem with the findings of [12]; [6] who submitted that education and training improves the skill, attitude and knowledge of an individual thus sharpening their ability to comprehend and apply innovations with ease. Therefore, since majority of the respondents were educated, it is expected that they perform and operate more effectively, efficiently and know more about natural resources and environmental sustainability than those who had no formal education. In addition, 67.3 percent had farming as their sole occupation while few (16.4%) were civil servants who also engaged in farming. The findings were in consonant with [4] assertions that farming is the major occupation among the people of Ogun State. About 37 percent had monthly income range of ₦ 20,100 – ₦ 30,000 with the mean monthly income of ₦ 18,536.26. This implies that majority of the respondents' income were within the range of national minimum wage which show that there is need for them to intensify efforts in utilizing more SMPs which could translate into increment crop yield and better income.

Type of soil management practices utilized by the respondents

Results in Table 2 show that zero tillage (97.3%), mulching (95.2%), ridging (92.7%), cover cropping (87.3%), crop rotation (77.3%), fertilizer application (73.7%) and bush fallowing (50%) were identified as the prevailing SMPs in the study area. On the other hand, SMPs like the use of green manures (40%), animal manures (15.5%) and compost (8.2%) were not popular in the study area. This result is line with the report of [18] who identified ridging, crop rotation, mulching, cover cropping and fertilizer application as the sustainable soil management practices in their studies but contrary to the reports of [2]; [1] which established compost, animal droppings and mixed cropping as the major sustainable soil management practised among the farmers studied.

Table 2. Distribution of respondents based on types of soil management practices prevailing in the study area. (n = 110)

*Soil management practices	Frequency	Percentage
Compost	9	8.2
Ridging	102	92.7
Fertilizer application	81	73.6
Zero tillage	107	97.3
Mulching	105	95.2
Use of animal manure	17	15.5
Planting of tree/green manure	44	40
Cover cropping	96	87.3
Rotational cropping	85	77.3
Bush fallowing	55	50

*Multiple responses
Source: Field survey, 2015

Crop yield of respondents

Analysis in Table 3 show rating of farmers' yield based on the utilization of SMPs in the last three copping seasons, almost half (38.2%) and above one-third (30.9%) of the respondents rated their yield obtained from their crops as high and very high respectively, while above one-quarter (28.2%) and very few (2.7%) agreed that their crop yield were average and low respectively.

This result implies that majority of the respondents agreed that the use of SMPs bring about increase in crops crop, this corroborates the findings of [7]; [23]; [9]; [5] which is claimed that the use of SMPs like mineral fertilizers, crop rotation, recycling of crop residues and organic manures increased farming productivity (crop yield).

Table 3. Distribution of respondents by rating their yield rating

Crop yield	Frequency	Percentage
Very high	34	30.9
High	42	38.2
Average	31	28.2
Low	3	2.7

Source: Field survey, 2015

Level of utilization of soil management practices

Results in Table 4 reveal that mulching (mean = 2.76) ranked highest among SMPs utilized by the respondents, followed by ridging (mean = 2.41), fertilizer application (mean = 2.26), zero tillage (mean = 2.25) and cover cropping (mean= 2.25). Others include rotational cropping (mean=1.65), bush fallowing (mean =1.62), compost (mean = 0.78), green manure (mean = 0.75) and use of animal manure (mean = 0.0.37). Comparing the grand mean score of utilisation (mean = 1.78) with the individual utilization mean scores, the results showed that SMPs like mulching, zero tillage, ridging, crop rotation and cover cropping were highly utilised by the respondents.

This may be due to the fact that these SMPs help to conserve soil water, control soil erosion and enrich soil nutrients by the decay of crop residue and leaves [17].

The use of zero tillage mitigates soil against the release of CO_2 and N_2O caused by intensive tillage and burning and also reduces destruction of soil structure [8]. On the other hand, compost, green manure bush fallowing and animal manures were least utitilised by the arable crop farmers.

The use of bush fallow ranked low probably because of greater dependency on the use of fertilizer and inadequacy of arable land for farmers. The result is in agreement with the finding of [8] that established that mulching, planting of cover crops, crop rotation and inorganic fertilizer were the most preferred and utilized soil conservative practices among arable crop farmers in Enugu State.

The result was also in consonace with the reports of [20]; [9] assertion that the use of green manure, compost and animal manure were the least used SMPs among farmers. This could be due to their irritating odour, tediousness of preparation, bulkiness and high cost of application.

Further analysis in Table 5 show more than two-third (69.1%) of the respondents were in the moderate level of utilisation of SMPs, while one-fifth (20%) and about (11%) had high and low levels of utilisation of SMPs respectively.

Table 4. Distribution of respondents by utilization of sustainable soil management practices (n=110)

*Soil management practices	Never Feq	Rarely Freq	Occasionally Freq	Always Freq	Ranked mean
Mulching	3	4	16	87	2.70
Ridging	1	31	0	78	2.41
Fertilizer application	2	4	67	37	2.26
Zero tillage	13	12	21	64	2.25
Cover cropping	7	16	29	58	2.25
Rotational cropping	14	13	36	47	2.05
Bush fallowing	39	5	25	41	1.62
Slashing and burying	51	43	5	11	0.78
Use of green manure	56	8	37	9	0.75
Use of animal manure	91	7	8	4	0.37

*Multiple responses, Grand mean score = 1.78,
Source: Field survey, 2015.

Table 5. Level of utilisation of soil management practices (n = 110)

Level of utilization	Utilization scores	Frequency	Percentage
Low	6 and below	12	10.9
Moderate	7 and 13	76	69.1
High	14 and above	22	20

Source: Field survey, 2015

This could be as a result of problems asssociated with their utiilisation such as inadequate supply of fertilizers and finance, hence it is recommended that government should supply fertilizers at subsidized rate to farmers and make loan avaialable for them.

Table 6 shows that inadequate supply of fertilizers (mean = 1.78) ranked highest among

the problems associated with utilization of SMPs, followed by high cost/non-availability of labour (mean = 1.69) inadequate finance (mean= 1.68), high cost of soil management practices (mean=1.22), poor knowledge of utilization (mean=1.15), transportation problems (mean = 1.10) and inadequate availability land (mean = 0.69). Comparing the grand mean score of constraint (mean=1.33) with the individual mean scores of constraints, the major problems faced by the respondents in the utilization of SMPs were inadequate supply of fertilizers, high cost and non-availability of labour and inadequate finance. This result gives credence to the finding of [14] who reported inadequate supply of fertilizer, non-availability of labour and inadequate finance as the highest ranking among the constraints faced by farmers utilizing sustainable land management practices in Kwara State.

Table 6. Distribution of respondents by problems associated with utilization of SMP (n = 110)

*Problem	Major problem Frequency	Minor problem Frequency	Not a problem Frequency	Ranked mean
Inadequate supply of fertilizer	90	16	4	1.78
High cost/ non availability of labour	86	14	10	1.69
Inadequate finance	86	13	11	1.68
High cost of soil magt practices	37	61	12	1.22
Poor knowledge of utilization	29	68	13	1.15
Transportation problem	53	15	42	1.10
Inadequate availability of land	14	48	48	0.69

* multiple responses, Grand mean= 1.33
Source: Field survey, 2015**.**

Results in Table 7 show that sex (χ^2=58.682), religion affiliation (χ^2=7.775), level of education (χ^2=16.459) and marital status (χ^2=4.281) had significant association with utilisation of SMPs among farmers at 0.01 level of significance in the study area.

The implication is that these significant socio-economic characteristics of farmers would affect their usage of sustainable soil management practices.

Results in Table 7 reveal that at 0.01 level of significance, respondents' age (r = 0.280) and years of farming experience (r = 0.451) had positive and significant relationship with utilization of soil management practices. Thus, increase in respondents' years of farming experience and age would increase their utilization of SMPs.

This finding is similar to the findings of [2] which established that years of farming experience had positive and significant relationship with choice of soil management practices.

Table 7. Chi-square showing association between respondents' socio-economic characteristics and utilization of sustainable soil management practices

Variables	χ^2	D.F	p-value
Sex	58.682*	1	0.016
Religion affiliation	7.775*	2	0.025
Educational level	16.459*	4	0.030
Marital status	4.281*	2	0.040

*significant at 0.01, * significant at 0.05, D.F = degree of freedom
Source: Field Survey, 2015.

Table 8. Chi-square showing relationship between respondents' socio-economic characteristics and utilization of sustainable soil management practices

Variables	Correlation coefficient (r)	p-value
Age	0.280	0.010
Farming experience	0.451	0.009
Monthly income	0.123	0.122

Source: Field survey, 2015

Results in Table 9 show that there was a positive and significant relationship between crop yield (r = 0.223; $p \leq 0.05$) and farmers' utilisation of sustainable soil management practices. The implication of this is that the higher the use of sustainable soil management practices among farmers the higher the crop yield. The results corroborates the findings of [7]; [9]; [5] assertions' that farmers use fertilizers which is one of the major SMPs to boost soil productivity with the aim of increasing arable crop production.

Table 9. Results of correlation analysis showing the relationship between crop yield and farmers' utilization of sustainable soil management practices

Variable	Correlation coefficient (r)	p-value
Yield	0.223*	0.030

*significant at 0.05 level of significance.
Source: Field survey, 2015.

CONCLUSIONS

Based on the findings of this study, mulching, ridging, fertilizer application, zero tillage and cover cropping were the major sustainable soil management practices utilized by the respondents and at moderate level. Inadequate supply of fertilizer and non-availability/high cost of labour were identified as the major constraints to effective usage of SMPs. This has implications on agricultural development in a country like Nigeria where land constitutes a major constraint to farming. Utilisation of sustainable SMPs among farmers would not only enhance productivity but also improve soil fertility. It is recommended that government and relevant agencies should be involved in promoting adoption and utilization of sustainable soil management practices through adequate training. Also, both organic and inorganic fertilizer as well as other farm inputs should be made available to farmers at subsidized affordable for farmers. This would enhance utilization of SMPs, higher productivity and environmental sustainability among farmers.

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SPECTRAL CHARACTERISTICS FOR ESTIMATION HEAVY METALS ACCUMULATION IN WHEAT PLANTS AND GRAIN

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Abstract

Plants would the start with step of a metal's pathway starting with the dirt on heterotrophic creatures for example, such that animals and humans, thus the substance from claiming metallic follow components for eatable parts of a plant representable accessible load of these metals that might enter those natural way of life through plants. Around metal elements, Cu and Zn would micro nutrients as they are essential in trace concentrations for physiological processes in plants. Furthermore consequently would a critical part from the soil–plant–food continuum. Therefor this study aimed to analysing the performance of multivariate hyperspectral vegetation indices of wheat (Triticum aestivum L.) in estimating the accumulation of these elements in plant dry mutter and the final product of Egyptian wheat crop irrigated with high concentrations of Zn and Cu. We applied five concentrations for each element (0.05, 20, 40, 100, and 150 ppm of Zn) and (0.02, 8, 10, 12, and 15 ppm of Cu) to a controlled greenhouse experiment to examine the effect of these concentrations on plant spectral characteristics and study the possibility of using spectroradiometry measurements for identifying the grain content of these metals. The results demonstrated that The hyperspectral vegetation indices had a potential for monitoring Zn concentration in the plant dry matter. NPCI and PSSR had a highest correlation with Cu phytoaccumulation into the grains with highest significant level (P-Value < 0.01) and (r) values (-0.39, -0.42).

Key words*: heavy metals, remote sensing, vegetation indices, detecting stress.*

INTRODUCTION

With advances in satellite, airborne and ground based remote sensing, reflectance data are increasingly being used in agriculture. It's a valuable tool in evaluation, monitoring and management of land, water, crop resources and plant stress detection. One of the important types of the plant stressors is the heavy metals. Some of these heavy metals such as Cu, Fe, Zn and Mg are essential elements for plant and play important roles in many physiological processes like metabolism, growth and development. Upon literature survey, we found scientific reviews that examine the effect of heavy metals on plant growth and function [4 and 1]. The trace metals exerting toxic effects on plants have been studied for over a century by now but there remains confusion within the literature with regards to their concentrations as micronutrients and as components inducing phytotoxic effects. Nevertheless, many problems arise when cells intake an excess of these essential elements or other heavy metals such as arsenic and lead, which are not known to have any essential functions, but are toxic and cause damages to living organisms. Excessive heavy metals in plants adversely affect plant growth and development [15]. The essential heavy metals (Cu, Zn, Fe, Mn and Mo) play biochemical and physiological functions in plants and animals. Two major functions of essential heavy metals are the following: (a) Participation in redox reaction, and (b) Direct participation, being an integral part of several enzymes [11].

Copper is an essential heavy metal for higher plants and algae, particularly for photosynthesis [10 and 2].

The inorganic and organic fertilizers (Fertilizer is a substance added to soil to improve plants

growth and yield.) are the most important sources of heavy metals to agricultural soil include liming, sewage sludge, irrigation waters and pesticides, sources of heavy metals in the agricultural soils . Waste water also contains heavy metal and when it is applied to crops, it can cause threat to soil and plants growing in that soil. Generally, heavy metals cannot be removed completely from waste water and when they enter into the soil, it will interfere with the plant roots and tissues, when these plants are eaten by animals or humans they will enter into food chain [8].

Healthy plants, those capable of maximum growth, are generally expected to have higher chlorophyll pigment concentrations than unhealthy plants. Reduced chlorophyll concentrations are often associated with stressed plants, with variations in total chlorophyll to carotenoid ratios used as stress indicators [9]. Various metal treatments have a negative effect on photosynthetic pigments such as chlorophyll-a, chlorophyll-b and total chlorophyll contents of plants where the photosynthetic pigments decreased with increasing heavy metals level in the soil [5].

The relationships between Zn concentration and the visible-near infrared spectrum of Triticum aestivum L. were studied by [3] and they found that, the pigment reduced with the increased concentration of Zn in *Triticum aestivum L*. Corresponding change in visible/near-infrared reflectance spectra of vegetation was observed. The reflectance spectra increased in the visible light region and the strength of blue shift of the red edge. [12], studied the changes in leaf reflectance spectra (350-2500 nm) due to metal phytoextraction (Cd, Pb, As and their metal-mixture treatments) into barley plants grown in pots. The results demonstrate the potential use of hyperspectral reflectance data to monitor plant health during phytoremediation process. [13] studied the performance of multivariate vegetation indices of rice in estimating the agriculture soil arsenic content and there results indicated that the three – band VIs might be recommended as an indicator for estimating soil arsenic content.

The present experiment was designed to investigate the possibility of using hyperspectral data for detecting Cu and Zn accumulation in plant dry mutter at different growth stages and the accumulation in wheat grains under Copper and Zinc stress. The effect of Cu and Zn was monitored, using irrigation water containing Cu and Zn singly and in combination, to investigate: (i) the effect of the interaction between Zn and Cu on wheat plants; (ii) which VIs are more sensitive to use for detecting the accumulation of these elements.

MATERIALS AND METHODS

Plant material and experimental design

A controlled pots experiment (Hydroponics experiment) was executed during the spring season of 2016 at the glass greenhouse at the University of Stirling, Stirling, United Kingdom (latitude 56°8`46.25``, longitude 3°55`4.54``) to track the different concentrations of Zinc and Copper on the Egyptian wheat (*Triticum aestivum L*.). The purpose of this experiment is to construct an index for the heavy metals stress response in Egyptian wheat.

The experiment was conducted using pots (28 cm diameter - 10 L volume) and 25 garden trays (120 cm * 55 cm). A total of 100 pots were planted using a planting (growing) media (black peat moss and perlite (1:1)) in a greenhouse. The pots were located inside the trays for caching the extra nutrient solution. Five concentrations of both copper (0.02, 8, 10, 12 and 15 ppm) and Zinc (0.05, 20, 40, 100 and 150 ppm) were used. Different treatments of both elements including 25 treatments were applied to study the ability of using the spectral measurement for predicting the accumulation of the both elements in the plant dry matter and the grain yield. Hoagland nutrient solution was used as a nutrient solution for the control treatment [14] and another 24 solutions were prepared for the micronutrient with different concentrations of Zn and Cu. The plant samples were collected 4 times during the growing season (At tillering, Inflorescence, flowering and milk development stages). The

fresh weight of shoots and leaves were recorded. Subsequently, the plant matter was oven-dried at 70 °C for 48 hours until constant weight, to obtain the dry weight (DW).

Measurements and data analysis

Analytical determinations of metals

Dry plant material and grains were ground to a fine powder and digested in a microwave with concentrated nitric acid. The metal concentrations were measured using Inductively Coupled Plasma optical emission spectrometry (ICP-OES).

Canopy hyperspectral reflectance data

An ASD Field Spec Pro spectroradiometer from Analytical Spectral Devices Inc. (Boulder, Co 80301 USA) was used to measure reflectance from plant canopies at a specific height from the plant canopy using artificial illumination. The reflectance measurements were made in a darkroom to avoid changing light intensity from solar radiation and to have a constant light incident on the plant canopy. This instrument can detect reflected light from the canopy ranging from 325 nm to 1075 nm, covering the visible near infrared (VNIR) portion of the magnetic spectrum. Each reflectance spectrum was the average of a number of scans (which was adjusted and calculated by the spectroradiometer). The spectral measurements were collected at various growth stages (At tillering, Inflorescence, flowering and milk development stages)).

Hyperspectral *VIs*

Vegetation indices were calculated by combining specific reflectance values along spectral signature. The most represented vegetation indexes were selected to detect differences in the reflectance between healthy (The control treatment) and stressed vegetation in visible and red-edge spectral regions. The VIs for different growing stages were calculated. The considered VIs in this study indicated by (Changwei Tan, *et al.*, 2013) and listed in appendix (1).

Calculations and statistical analysis The chlorophyll concentration was calculated from the SPAD-502 chlorophyll readings (Wood, Reeves, and Himelrick, 1993), using the following equation:

$$y = 0.996x - 1.52$$

Where y is the chlorophyll concentration and x is the SPAD-502 chlorophyll readings (µg.cm-2).

Leaf area index (LAI)

Calculated as a ratio of leaf surface area and the occupied land area of this plant (Elmetwalli, 2008).

Statistical analysis

Statistical analysis of spectral and chemical data was performed using R software and reported at ($P < 0.05$) significance level. Mean and standard deviation (± SD) were computed for all data. Data were statistically tested for significant effects through correlation, linear regression, and multiple regression analysis. Correlation coefficient (Pearson's "r") between spectral variables was computed.

RESULTS AND DISCUSSIONS

(1)Metal accumulation into the plant dry matter

Results of chemical analysis for Zinc and Copper concentration in plant samples at different four dates under different treatments illustrated in Fig (1 a).

The results shows a high positive correlation between the amount of Zn in plant dry matter and the add concentration in irrigation water at different stages (0.85, 0.89, 0.95, and 0.98) with high significant level (P-value < 0.001) as shown in table (1).

The increasing of Cu level increased the Zn accumulation in to the plants, while the higher level of Zn decreased Cu uptake.

High zinc concentrations facilitated copper uptake by the roots but reduced its transfer to the aboveground organs [7], as shown in Fig. (1 b).

The Copper concentration in irrigation water has insignificant effect at significant level P-value <0.001 on the dry matter Cu content but it has a significant positive effect at P-value < 0.01we can observe that from R^2 (0.16, 0.17, and 0.15) and P-values < 0.01 at Tillering, Inflorescence, and Milk development stages respectively as shown in table (1).

These results confirms the differences in the plant canopy reflectance as a result of plant content of Zinc and Copper.

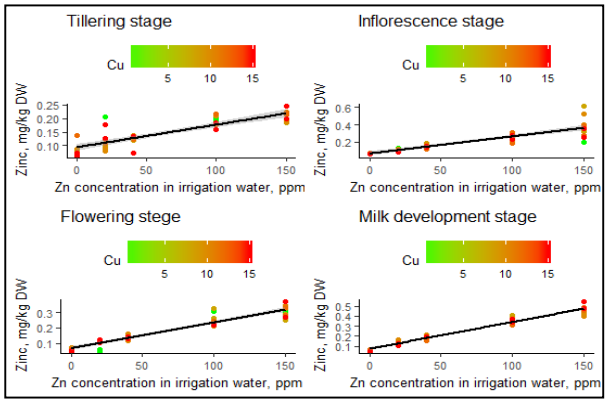

Fig. 1 a. Effect of Zn level add in irrigation water on the plant dry matter content of Zin

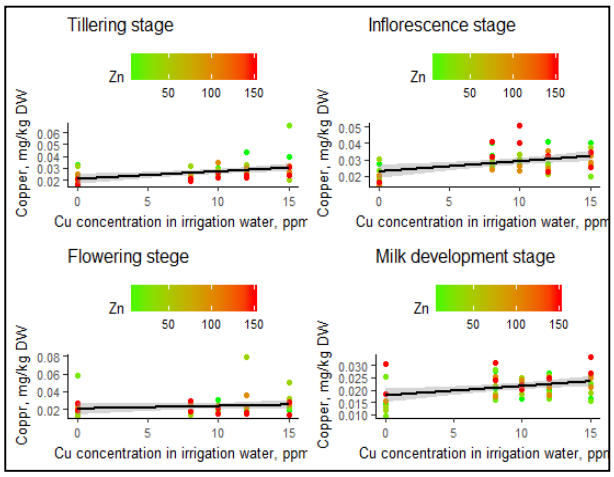

Fig. 1 b. Effect of Cu level add in irrigation water on the plant dry matter content of Copper

Table 1. Correlation coefficient, R2, Adj-R2, and P-value for the effect of Zinc, Copper and the interaction between the both elements on the dry matter content of Zn and Cu

Parameter	Growth stage	Source of stress							
		Zn			Cu			Zn*Cu	
		R^2	P value	r	R^2	P value	r	P value	Adj-R^2
plants content of Zn	Tillering	0.73	0.000***	0.85	0.000	0.9	-0.01	0.000***	0.72
	Inflorescence	0.78	0.000***	0.89	0.000	0.9	-0.01	0.000***	0.78
	Flowering	0.91	0.000***	0.95	0.00	0.9	-0.00	0.000***	0.91
	Milk development	0.96	0.000***	0.98	0.000	0.98	-0.00	0.000***	0.96
plants content of Cu	Tillering	0.06	0.09	-0.24	0.16	0.00**	0.4	0.00**	0.17
	Inflorescence	0.001	0.82	0.03	0.17	0.00**	0.41	0.02*	0.14
	Flowering	0.00	0.83	-0.03	0.02	0.3	0.13	0.82	-0.04
	Milk development	0.12	0.013	0.35	0.15	0.00**	0.38	0.00**	0.22

*** A significant effect at P-value < 0.001 ** A significant effect at P-value < 0.01 * A significant effect at P-value < 0.05

Correlation between heavy metal concentrations add in irrigation water and it's concentration in plant dry mutter:

To build heavy metal concentration prediction models, the linear regression was used to find the relationships between plant dry mutter content of heavy metals and heavy metal concentrations in irrigation water

Table 2. Validation results of regression models for estimating dry mutter Zinc content depends on two-band hyperspectral vegetation indices

Two-band Vis	Growth stage	Curve shape	Fitting model	R	Significantly
Zn accumulation in plant dry matter					
NDVI	Flowering	Linear	3.24 - 3.56 NDVI	-0.56	0.000***
	Milk development	Linear	4.21 - 4.81 NDVI	-0.52	0.000***
SR _680_b	Flowering	Linear	0.708 - 0.04007 (SR -680-b)	-0.57	0.000***
	Milk development	Linear	0.966 - 0.0686 (SR -680-b)	-0.54	0.000***
NPQI	Flowering	Linear	-0.0410 + 1.544 NPQI	0.59	0.000***
	Milk development	Linear	0.0451 + 1.869 NPQI	0.53	0.000***

Plant dry matter Zn content prediction models

The Zn content prediction models showed in table (2) was obtained by linear regression carried out between Zn content and Zn levels in irrigation water

Table (2) shows a high correlation between the both factors in different growth stages with high R^2 values and high significant P- value < 0.001 under the experiment circumstances.

The plot of measured plant dry matter content of zinc against predicted Zn concentration and

the results obtained from the testing of the models are displayed in Figure (2).

The plot of measured plant dry matter content of Copper against predicted Cu concentration and the results obtained from the testing of the models are displayed in Figure (3).

We were found that the prediction models at different stages predict the dry matter content of Zn with high significant (P-value < 0.001). The correlation coefficient between the measured Zn concentrations in dry matter and the predicted values was a high positive correlation at different growth stages (0.85, 0.89, 0.96, and 0.98).

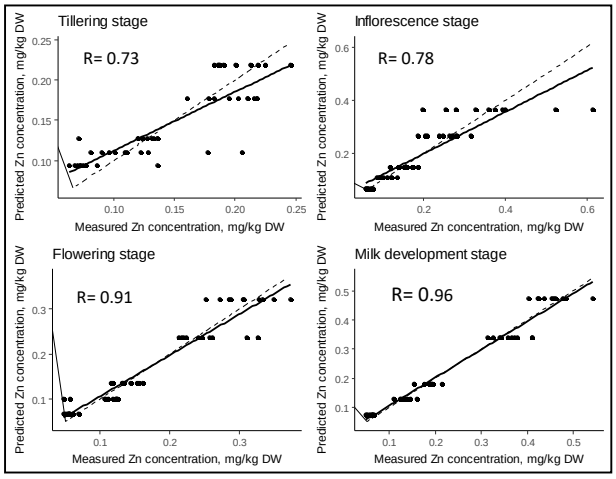

Fig. 2. Validation of Zn effect prediction models on Zinc accumulation in plant dry matter

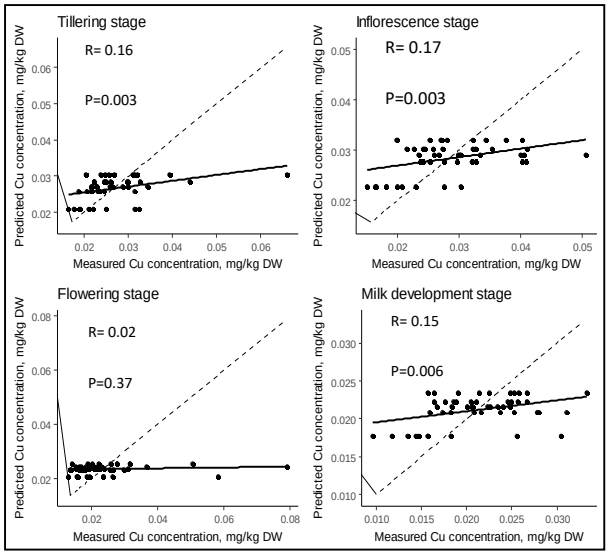

Fig. 3. Validation of Cu effect prediction models on Copper accumulation in plant dry matter

(2)Relationship between two-band vegetation indices and the plant dry mutter content of heavy metals

(i) Zn accumulation

All vegetation indices calculated from the dataset and the regression models were validated using the validation dataset.

The correlation coefficient (r) between the measured and estimated values of the validation data set were applied. Figures 4 (a, b), 5 (a, b), 6 (a, b) show the highest correlated two- band VIs with the Zn concentration in dry mutter and the statistical models that can be used for detecting the accumulated Zn in plant dry mutter.

We can observe that almost two-band VIs a negative correlation with dry mutter Zn content, but this negative relationship starts at late growth stage.

The negative correlation started to appear at flowering and milk development stages. The highest correlated two-band VIs were NDVI, SR-680-b, and NPQI. NDVI and SR-680-b had a negative correlation with the Zn accumulation in dry mutter at the flowering and milk development growth stages with high significant level (P-value < 0.001).

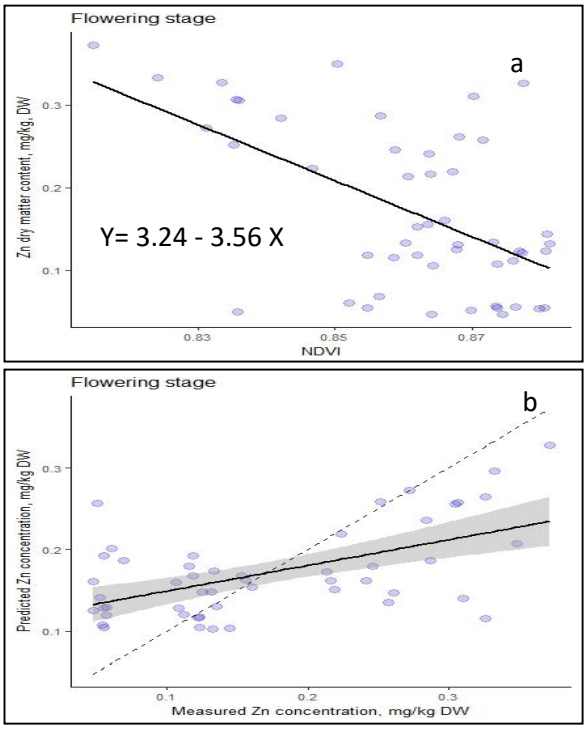

Fig. 4 a. (a) Relationship of plant dry mutter Zinc content against NDVI, and (b) measured and estimated dry mutter Zin contents of the validation dataset based on NDVI at flowering stage

Fig. 4 (a, b) and Fig. 5 (a, b) show the relationship of plant dry mutter Zn content

against NDVI and SR-68-b and the validation of prediction statistical model at flowering and milk development stages.

NPQI had a positive relationship with the accumulated zinc concentration at flowering and milk development stages with high significant level (P-Value < 0.001).

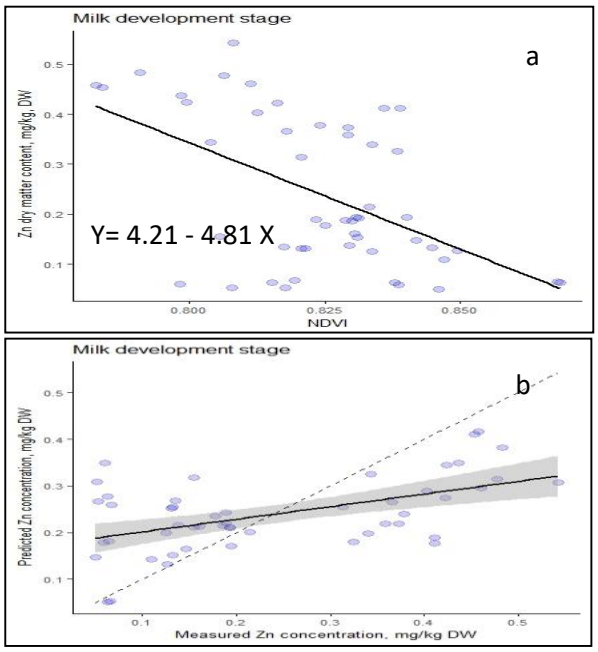

Fig. 4b. (a) Relationship of plant dry mutter Zinc content against NDVI, and (b) measured and estimated dry mutter Zin contents of the validation dataset based on NDVI at milk development stage

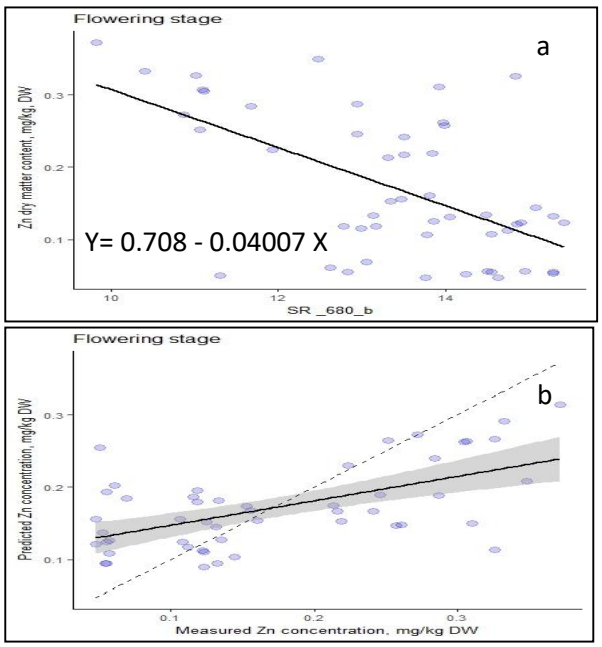

Fig. 5 a. (a) Relationship of plant dry mutter Zinc content against SR-680-b, and (b) measured and estimated dry mutter Zin contents of the validation dataset based on SR-680-b at flowering stage

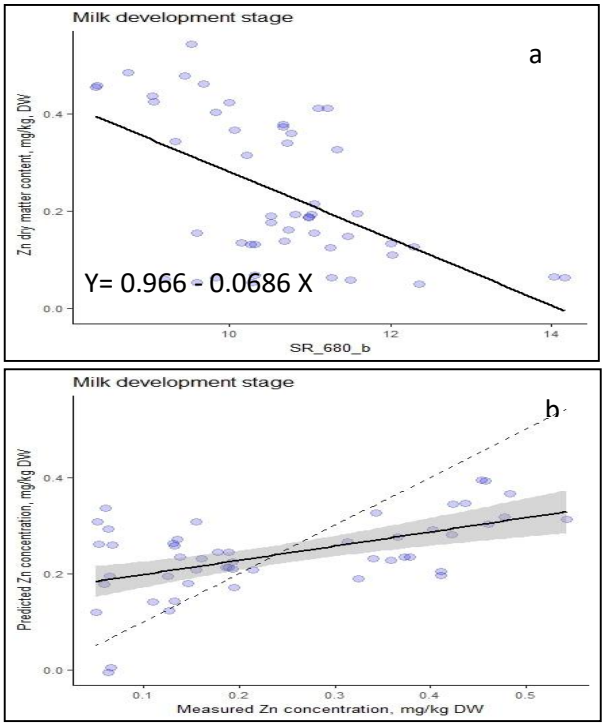

Fig. 5 b. (a) Relationship of plant dry mutter Zinc content against SR-680-b, and (b) measured and estimated dry mutter Zin contents of the validation dataset based on SR-680-b at milk development stage

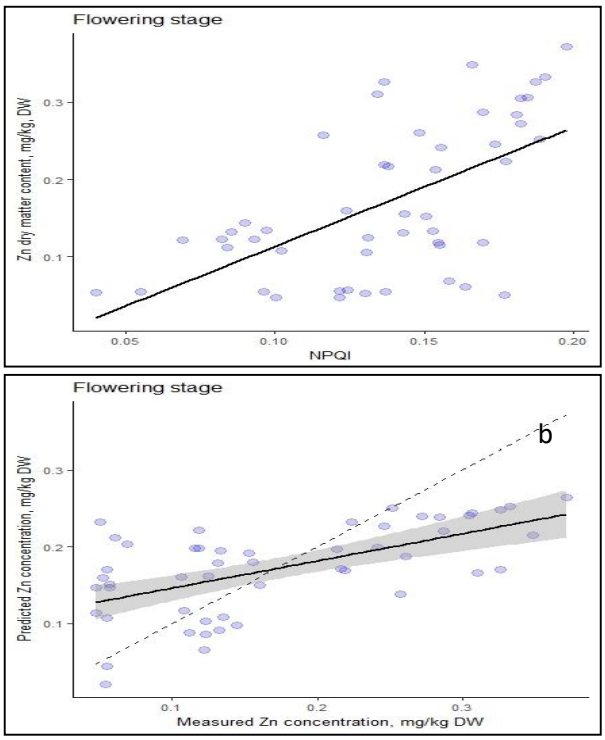

Fig. 6 a. (a) Relationship of plant dry mutter Zinc content against NPQI, and (b) measured and estimated dry mutter Zin contents of the validation dataset based on NPQI at flowering stage

Fig. 6 (a, b) show the relationship between NPQI and the dry mutter Zn content and the validation of the statistical prediction model.

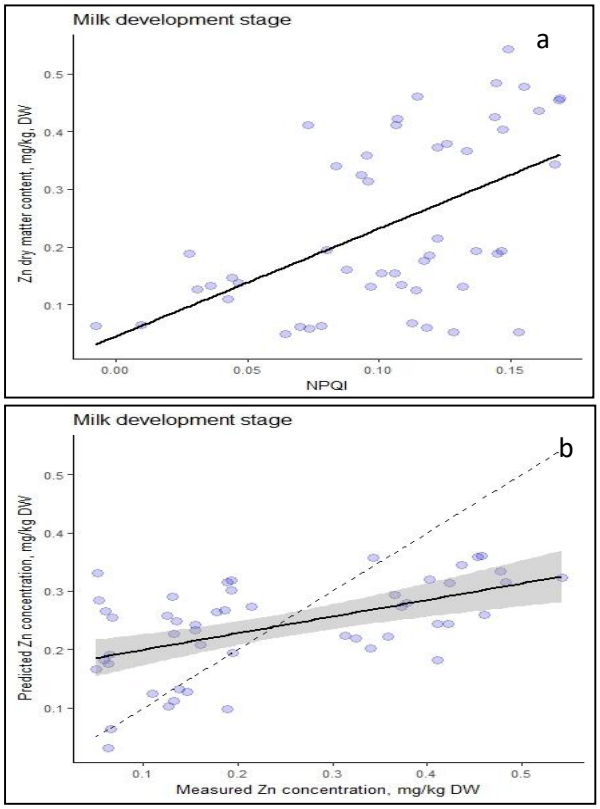

Fig. 6 b. (a) Relationship of plant dry mutter Zinc content against NPQI, and (b) measured and estimated dry mutter Zin contents of the validation dataset based on NPQI at milk development stage

(ii)Cu accumulation

The results of regression analysis between Cu accumulation in to the plant dry mutter and two-band VIs demonstrated that the almost of two-band VIs have a negative correlation with dry mutter Zn content, but this negative relationship starts at late growth stage. The negative correlation started to appear at milk development stage. The highest correlated two-band VIs were NDVI b, GNDVI, SR _680_b, PSSR, PSND. All of these VIs had a negative relationship with low values of correlation coefficient (r). NDVI b, GNDVI, PSSR had a correlation coefficient (r) values (-0.36, -0.37, -0.36) respectively with significant level at (P-Value < 0.01), but SR _680_b and PSND had a correlation coefficient (r) values (-0.37 and -0.36) with significant level at (P-Value < 0.05). From these results we can mentioned that the two-band vegetation indices are low correlated with the Copper accumulation in to the plant dry matter.

(2)Metal accumulation into the grains:

Relationship of grains heavy metal content against its concentration in irrigation water:

The *r* and P-Value for the grains Zinc content prediction models based on irrigation water content of Zn and Cu are provided in Figures (7, 8, 9, 10, and 11). Copper had a high positive correlation (r = 0.98) with high significant (P < 0.001) on Zn accumulation in the grains. We can refer this result to the positive relationship between the Cu level add in irrigation water and Zn accumulation in plant dry mutter at deferent growth stages generally and at the last growth stage (Milk development stage) specially.

Equation (1) shows the interaction effect on the accumulation of Zinc into the grains statistical prediction model.

Equation 1

$$y = -1.38(ZnCu)^2 + 5.94ZnCu + 1.25$$

Equation (2) shows the interaction effect on the accumulation of Copper into the grains statistical prediction model.

Equation 2

$$y = -1.38(ZnCu)^2 + 5.94\,ZnCu + 1.25$$

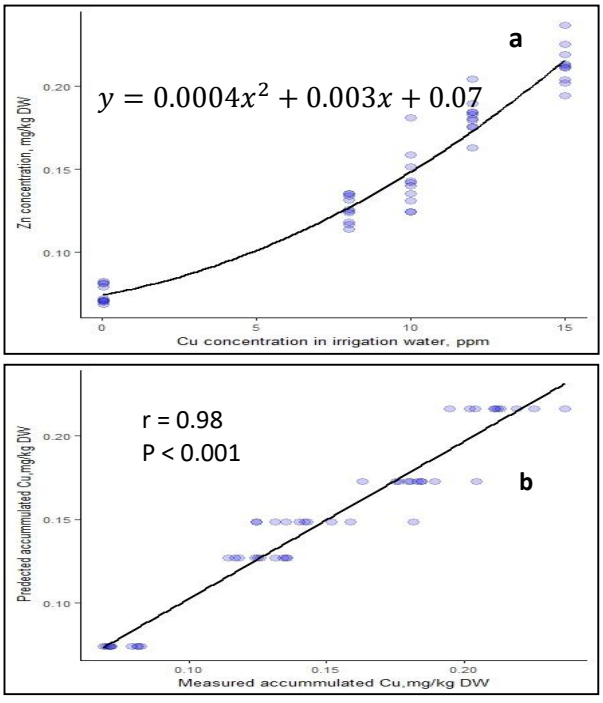

Fig. 7. (a) Relationship of wheat grains Zinc content against irrigation water Copper content, and (b) measured and estimated grains Zin contents of the validation dataset based on Copper concentration in irrigation water

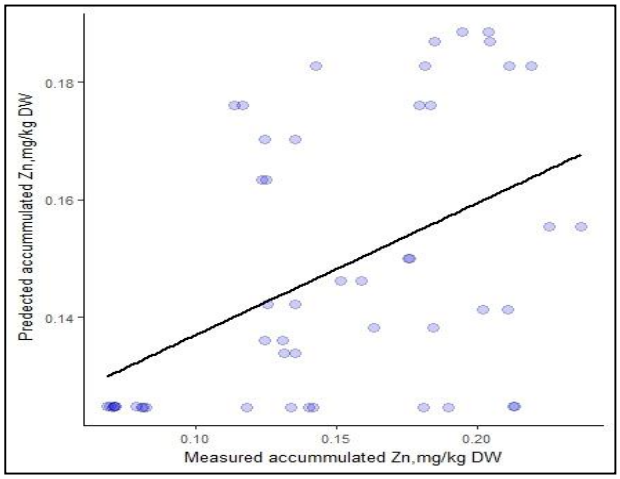

Fig. 8. Measured and estimated wheat grains Zn contents of the validation dataset based on the interaction between the irrigation water content of Zinc and Copper

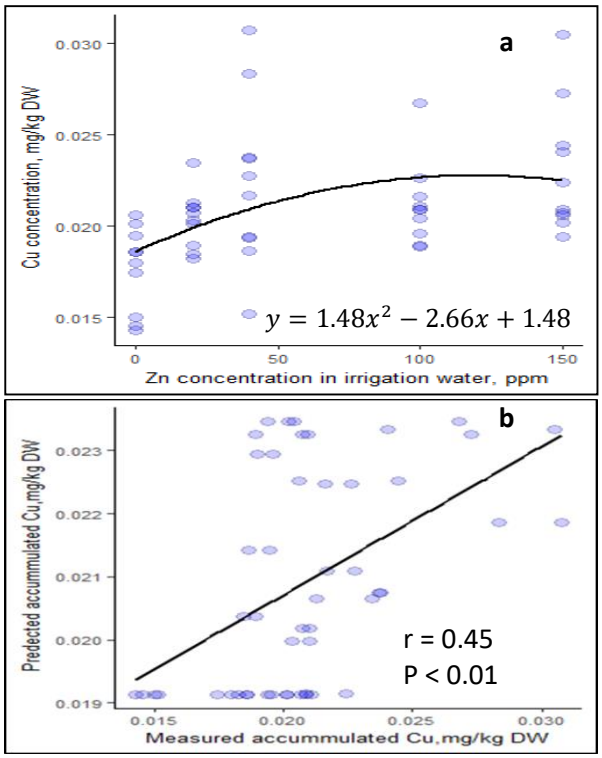

Fig. 9. (a) Relationship of wheat grains Copper content against irrigation water Zinc content, and (b) measured and estimated grains Cu content of validation dataset based on Zn add in irrigation water

Figure (9) illustrates the relationship between the Zn concentration in irrigation water and Cu accumulation into the grains. The figure shows a polynomial negative relationship between Zinc concentrations add in irrigation water and the Copper accumulated into the grains with significant level (P-Value < 0.01).

The irrigation water Copper content had a polynomial positive relationship with Cu concentration in grains as illustrated in figure (10) with significant level (P-Value <0.05). The interaction between the irrigation water content of Zn and Its content of Cu had highest correlation with the Copper accumulation into the grains with high significant level (P-Value <0.001). Fig. (11) shows the validation of prediction statistical model of interaction effect on grains Copper content.

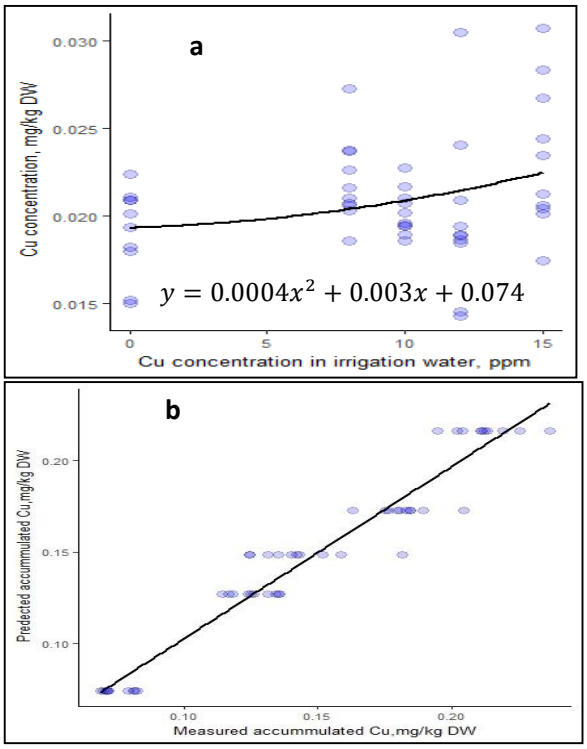

Fig. 10. (a) Relationship of wheat grains Copper content against irrigation water Copper content, and (b) measured and estimated grains Cu content of validation based on Cu add in irrigation water

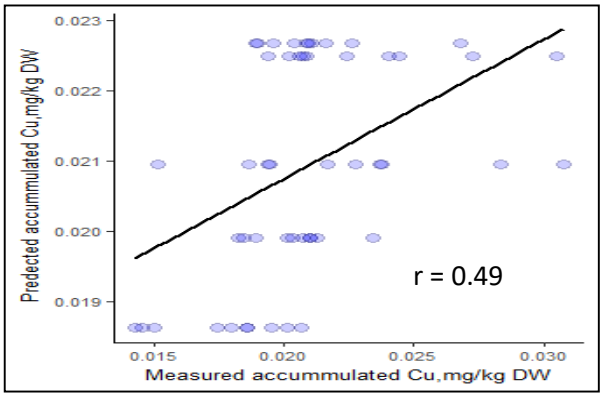

Fig. 11. Measured and estimated wheat grains Cu contents of the validation dataset based on the interaction between the irrigation water content of Zinc and Copper

Relationship of grains heavy metal content against vegetation indices (VIs)

Two-band VIs had an insignificant relationship with Zn accumulation in grains. In contrast Cu accumulation into the grains had a significant relationship with the almost of two-band VIs with low correlation coefficient. NDVI, GNDVI, RNDVI, SR – 680, and NPQI had a significant correlation with grains Cu content at (P-Value <0.05) and r (-0.30, -0.31, -0.30, -0.33, and 0.36) respectively. NPCI and PSSR had a highest correlation with Cu phytoaccumulation into the grains with highest significant level (P-Value < 0.01) and (r) values (-0.39, -0.42).

CONCLUSIONS

Results of present study demonstrate that hyperspectral reflectance data, as well as studied VIs appears to have potentials for monitoring the phytoaccumulation of Zn into above-ground parts of wheat. The hyperspectral vegetation indices had insignificant correlation with Zn accumulation in to the grains, but it had a significant negative relationship with Cu concentration in grains with low correlation coefficient values.

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DEVELOPMENT MODEL OF MANGO AGRIBUSINESS AS AN EFFORT TO ENSURE SUPPLY CONTINUITY

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Abstract

Gedong Lipstick Mango (reddish mango) is a commodity with economic and strategic value because it has a pretty good market opportunities in the local and export markets. Majalengka can be regarded as one of the Gedong mango production center that considerable potential in West Java, especially in the District of Panyingkiran. However, mango cultivation still has problems ranging from manufacturing to post-harvest which still modest. It has not applied the proper technology so that the harvest quality is still low with discontinuity production as well as relevant actors who do not have a good synergy which adds to the increase of complex problems in mango farming. This research aims to assess the occurrence of unstructured problems and is expected to offer a solution of adaptive mango agribusiness development. This study is a qualitative design using case study method and system thinking of soft system methodology (SSM) approach. The results showed that the formulation of improvements to be made in mango cultivation is the coordination and collaboration among related parties which are optimized through control activities by performing intensive coaching and mentoring. There is also dissemination of information and technology related to the implementation of innovation in supporting the continuity of supply that generates a model of agribusiness development in integration with related parties which supported government regulation. Similarly, a partnership with industrial companies or structured market through the principles of justice should be reorganized with the establishment and strengthening cooperatives as facilities for mango farmers in realizing a strong mango agribusiness system and implementing appropriate corrective measures according to SSM results.

Key words**:** *agribusiness, mango, continuity of supply, soft systems methodology*

INTRODUCTION

Mango is one of the commodities that possess economic and strategic value. This commodity has also sizeable market opportunities in both domestic and export markets. People fond of *Gedong Lipstick Mango* because it has a high nutrient content. Mango consumption per capita per year based on the national socio-economic survey of Central Bureau Statistical Agency since 2008 to 2014 is likely to increase. It reached the highest rate in 2011 with a number of 0.63 kg/capita/year or an increase of approximately 200% over the previous year and is considered the highest level of mango consumption in the last 5 years [2].

West Java province is counted as one of pillar region in the development of *Gedong mango*, particularly Majalengka regency. On one side, mango has prospective potential, but on the other hand, it still has problems that must be resolved. In general, the cultivation and development of mango are facing various problems, namely (i) it is greatly influenced by season/weather (ii) scale farming is still relatively small (iii) marketing is still done by *Tebasan* (a selling method by which the farmer sells his product to labor contractor/*penebas* for cash before the harvest), *Ijon* (similar to *Tebasan* by which the farmer mortgages his green crop for money) and contract that lead to the exploitation of production due to the insistence economic needs, avoiding the risk of production failure and large maintenance costs, (iv) benefit is mostly enjoyed by traders instead of the mango farmers [1]. Mango farmers in Majalengka are also experiencing pretty much the same problems in cultivating the crops. They are ranging from culture systems that have not been able to apply the proper technology yet which causes low- quality products and fluctuation of production whereby resulting to price fluctuations as well. An old system is still applied in the process of harvesting and post-harvesting, especially in

marketing which has not yet held the coordination and synergy among parties related.

Other problems frequently encountered in the development of mango agribusiness are the inability of farmers to fulfil market demand for continuity of product supply and products which have not met the quality of consumer preferences which clearly appear on the purpose to enter industrial and export markets. Institutional partnerships are weakened compared to the previous one which had been built several years ago, due to the lack of commitment and coordination which leads to the low access of markets among the mango agribusiness actors. The un-optimized application of the proper cultivation technology, inappropriate post-harvest due to the imbalance in the mastery of science and technology, and capital assets are also obstacles in mango agribusiness. A question arises from such complex problems would be how to describe these unstructured problems and offer a solution for real-world improvements in the sustainability of production and also produce an adaptive mango agribusiness development model.

MATERIALS AND METHODS

This study is a qualitative using case study designed to explore issues that are not structured, digging the cause of the discontinuity of production, and offers a range of solutions from actors and stakeholders in the development of mango agribusiness. A system thinking with soft system methodology (SSM) approach, is used to analyze the development of mango agribusiness. SSM defines and states the problems and conceptual models existed to support in understanding the issues so as to produce an agreement, the real action, and perception [6].

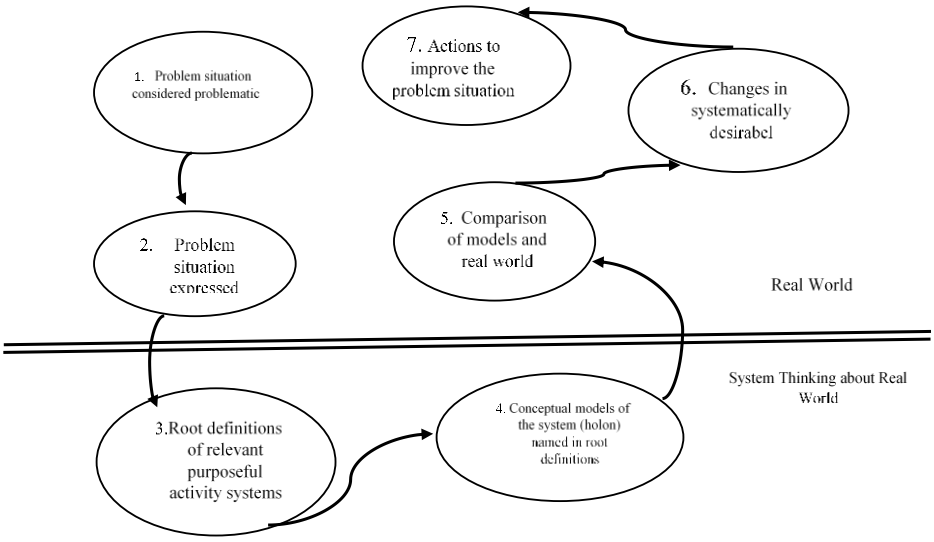


Fig. 1. Stages of SSM (Source: Checkland & Scholes, 1990)

Soft system methodology (SSM) developed by Checkland in the 1980s as a process of research and study measures to improve the situation of unstructured problems where issues are vague perceived but not clear. SSM is an organized way to handle a situation of social problems. SSM approach is the intellectual tools used to design and implement changes in the social issues of the reality/reality in ways it needed to improve something better. Changes proposed by the SSM can be a strategic issue or at the operational level in social problems [7]. In the SSM approach, some illustration of the interactive process covered in seven stages. Those stages are: (a) examining the unstructured problems (Rich Picture); (b) expressing the problem situation (cultural analysis); (c) establishing the definition of the

problems associated with problem situations (CATWOE); (d) building conceptual models (HumanActivitySystem-HAS); (e) comparing conceptual model with problem situation; (f) establishing a feasible and desirable changes; (g) taking corrective action on the problems [4]. Stages in detail can be seen in Figure 1.

RESULTS AND DISCUSSIONS

Mango Cultivation Agribusiness

Majalengka regency is one of the centers of mangoes production in West Java province. The main mango species developed in the central areas are *Harumanis mango, Gedong Lipstick, Golek, Cengkir,* and others. Among those, *Gedong Lipstick mango* is a superior product in the region that has the competitive value which is expected to increase the income of mango farmers who cultivate it. Cultivation of mango agribusiness is still considered modest starting from maintenance activities, harvest, post-harvest to marketing. In general, it is a plant that has been cultivated since long ago, while a process of planting new mango can be regarded as a complete stage of mango agribusiness [1].

Since 2001, there is an enactment of leading commodities in Majalengka, one of which is fruits including mango *Gedong lipstick, durian* (king of fruit), banana, and avocado; all based on the suitability of agroecosystem in each region of development-production center. Since the establishment, until now Majalengka becomes one of the central areas of mangoes in West Java and it has become the plant that the public interest to cultivate, although there are still many farmers who undertake mango only as secondary crops. However, there are also some farmers who have started to commercialize this mango crop in semi-intensive planting system, even monoculture cropping pattern has already spread in the area of wetland and upland. Nevertheless, by overviewing the general conditions on the ground, most of the mango farming has not been carried out intensively for commercial purposes. In mango cultivation, activities starting from maintenance such as land clearing, fertilizing, and pest eradication are still applying the old/ modest system, so did the harvest and post-harvest activities.

Due to a number of labour costs to be incurred by farmers for the harvest and post-harvest, the majority of them choose systems to harvest as follows: (1) *Ijon system* (bonding system), as a system of debt confinement by which the transaction is carried out during the mango plants are in bloom with the calculation through an assessment of mango tree per unit, (2)*Tebasan system* (slash system), this harvesting system is executed by purchasing at the time young mangoes has been formed which make it easier for farmers and buyers to set the price. However, there is a delay in payment to the farmer due to the traders who wait for the payment from the "big buyers" or wholesalers. The farmers find no objection for such systems because they have already established business ties with traders villages and wholesale traders. There is even a close attachment when farmers need capital for their mango farming and the wholesalers immediately give them which also means indirectly bind them for their mango marketing. That way, the farmers have a very low bargaining position because the price for mango selling can only be determined by the buyer, in this case, those traders or wholesalers.

In general, marketing on mango crops is established through linkages between traders or wholesalers and farmers which have already been patterned before, despite there is a higher price offer. This is due to the dependence relationship and habit among actors in the marketing. the farmers find it rather hard to sells products by themselves since the traders or wholesalers actively approach farmers, especially those who desperately needs money for their business or family needs. They would borrow money from that traders or wholesalers by installments and make obvious attachment and dependence to them. Similarly, the provision of pesticides/insecticides is also obtained from traders/wholesalers.

Soft Systems Methodology (SSM)

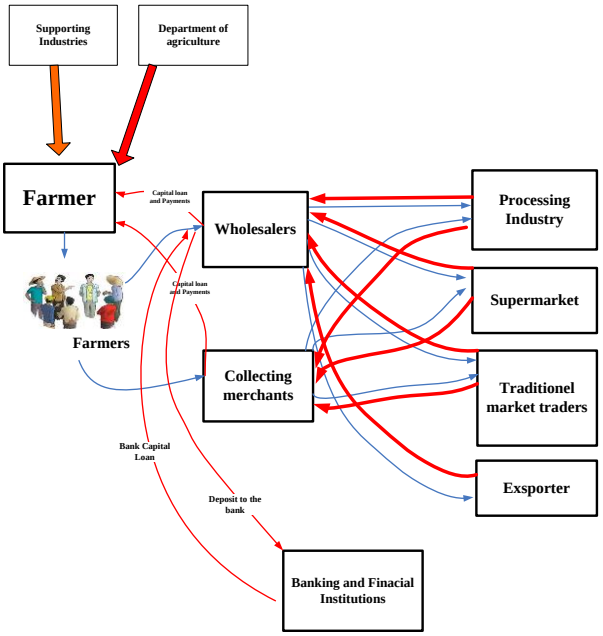
Actual Condition

A complex problem is a hallmark of business activity, including in mango agribusiness supply chain. It occurs due to the interaction of

the various actors in this business from upstream to downstream, as well as the unsustainability of mango production which failed to meet the predicted increase in market demand and cause fluctuating price. To overcome the unsustainability of mango production due to the fact that it is a seasonal crop, off season technology is now widely applied, except for the mango farmers in Majalengka since they have a limitation in human resources and capital. Limited human resources management, implementation of modest technology, and limited capital in mango cultivation cause for modest activities from maintenance to harvesting with low result product quality as well. In addition to small quantity products which have not been able to meet the predicted increase in market demand, the low quality is also a factor of farmers' inability to enter the structured market, that is a definite pattern of purchase market with pricing contracts such as industrial companies, supermarkets, and export. Accordingly, there is no recent partnerships between farmers/farmers' group with industrial companies or structured market which previously established in 2005. PT. Indo Fresh was purchasing mango and provided guidance to mango farmers in maintenance activities in collaboration with the Department of Agriculture, although this cooperation is still limited to the types of *Gedong lipstick mango* [1]. Unfortunately, that cooperation only lasted for a year because the two parties did not meet the commitment of the partnership agreements.

Rich Picture

Rich picture is used to understand the circumstances of the problems from various perspectives, structure, process activities in agribusiness mango cultivation, the relationship, and conflict between the actors involved whereby such abstract things are visualized by means of symbols. Rich picture is the result of supply chain mapping that has been done through external validation of focused group discussion. The rich picture below shows the activities in mango agribusiness.



Notes : → : cash flow
→ : the production's stream

Fig. 2. Rich Picture of Mango Cultivation
Source: Primary data, 2014, Processed

Figure 2 shows that the whole picture of activities in mango cultivation begins with the identification of mango farmers incorporated in a farmer group. Actors involved in the supply chain of mango consists of supporting industry (in this case is an input provider or mango seed supplier), *saprotan* (agricultural inputs) store as agro input sellers which

generally facilitated by traders (big and small ones) or wholesalers who come and actively approach mango farmers to buy their products to the extent of creating dependency in purchasing and selling engagement through finance for mango cultivation, and the involvement of various parties including Department of Agriculture, Department of Trade and Industry, banks and other financial institutions. Usually, mangoes from farmers or farmer groups go directly to traders or wholesalers, and wholesalers would directly deal with buyers such as supermarkets, traditional markets, exporter (about 5%), and to the processing units which still a little in number.

CATWOE Analysis Based on Transformation

Problems existing in the operational of mango agribusiness are studied and analyzed by CATWOE to transform the events by means of dialogue and direct observation in the field, then identified the structures and roles, the relationship between the role of stakeholders, values and also norms [4]. Cultivation of mangoes in the research area showed an unoptimized development which can be seen from the maintenance which is still not in accordance with the Standard Operating Procedure (SOP), for example, pruning the young plants with patterns of 1, 2, and 3, namely one main stem with two buds and each bud consists of three branches. The same thing happens in the harvest and post-harvest activities with an unoptimized application of technology. Based on that, it is necessary to take a model of development in mango agribusiness to maintain its sustainable production. According to CATWOE analysis results, an assessment is formed to produce a formulation in making changes by comparing the model with the actual occurrences in the reality/reality.

Table 1. Actual Condition in Mango Agribusiness Cultivation

Process of Activities in Mango Agribusiness Cultivation	**Actual Condition in Mango Agribusiness Cultivation**
Maintenance	It is still modest and not in accordance with SOP.
Harvest and post-harvest	It is still modest with confinement system of *Ijon* and *Tebasan*.
Sorting	It is done by traders (big and small) or wholesalers.
Capital	There is no adequate capital assistance and still rely on the loan from collectors, traders or wholesalers. There is also barely interaction between farmers and banks or other financial institutions. `
Partnership	There is no reconnection/re-collaboration with industrial companies or export.
Farmer groups	It has not taken a role as a medium of information and communication, media coaching, consulting and marketing.
Pricing	There is no involvement of mango farmers as producers of mango.
Payments from traders/*Bandar*/ Wholesalers	There is a payment delay.
Continuity of production	Uncertainty of production sustainability

Source: Primary data, 2014, Processed

Based on Table 1, the actual conditions associated with the results of studies in the field, the un-optimized of mango cultivation can be seen in the research area resulted in many things that should be managed properly. Modest maintenance is still applied without complying to mango cultivation SOP with harvest and post-harvest confinement system of *Ijon* and *Tebasan*. Mango farmers in Indramayu sell their products using *Tebasan* system with a price of around 73.3% lower than the actual price and sell the remaining of their own harvest to the collector. Factors affecting farmers to choose to harvest with Tebasan system is the need for fast cash and avoiding labour expenses and the high cost of harvesting [9]. It is in contrast to the study, which explained that farmers will obtain higher mango prices and market certainty if they sell their mangoes to AFMM (Association of Farmers and Mango Merchants), but overviewing from the field, there are only a few farmers join this institution. Partnerships that ever existed in 2005 has not yet been re-established in present time and makes mango market limited to traders or wholesalers only [8]. Viewing from the needs, interests, and benefits, this partnership is very important and

should be established in the business world. The partnership has great benefits which are improving access to capital and production factors, increasing market access, implementing the recommended technology, and managing risk better. In agribusiness system, the partnership is crucial since it can unite the farmers from various sub-systems of production and other sub-systems with the hope of improving the efficiency, productivity, and income of farmers.

The implementation of off season technology to maintain continuity of supply can not be done in the research area. It can be applied since February to June each year, so that the mango production is sustainable. Currently, this technology still relies on nature compared to users in Cirebon (another district in West Java) who has already implemented the technology for quite some time. The off season technology emphasizes more to stimulating flowers as well as plant growth regulator, balanced fertilizer, and pruning. However, the farmers still take into account the costs they incurred to the risk of failure and the skill they have [8].

Cultural Analysis

Cultural analysis viewed intervention as a problem and identification as follows: structure and roles intervention, relationship seen from that values, norms, and roles [4].

Table 2. Aspects Related and Description, Condition and Drivers in The Development of Mango Agribusiness

No.	Aspects Related to the Development of Mango Agribusiness	Description, Condition and Drivers in The Development of Mango Agribusiness
1	Client	Mango farmers, farmers' groups, traders, wholesalers, Department of Agriculture, user/consumer, business processing
2	Aspiration clients	To produce sustainable mango production optimally with good quality
3	Troubleshooting	To optimally manage mango cultivation through guidance to the farmers to implement the technology complying to SOP and enhances participatory collaboration among *stakeholders* in an effort to re-establish partnerships with industry, and also increasing market access and maintaining the continuity of mango supply through *off season* technology application
4	Resources Availability	The increasing trend of market demand both local and export, mango farmers and farmer groups
5	Constraint	Un-optimized management, less market access, partnerships which have not yet been established with market access, including the processing industry
6	The cause of Constraints	Lack of collaboration and coordination among actors which formed un-optimized management of mango agribusiness and there is no strong institutions to bridge the interests of farmers
7	Implications of selected issues	If collaboration among parties involved in mango agribusiness can be improved with optimal management and better technology implementation, it will create production sustainability with better quality
8	Reasons determine the problems	There is no partnership established yet which makes farmers have less market access. Unsustainable production and the absence of mango processing management resulted in un-optimized income for farmers
9	A positive value of the problem	Ensuring the continuity of mango production with better quality and more secure market access through partnerships to set stable prices, and also the formation of farmer institutions in bridging the farmer's interests in hopes for mango farmers' welfare guaranteed

Source: Primary data, 2014, Processed.

Structure and Role Intervention

Relationship Between Roles, Values, and Norms

Mango is a potential commodity to be developed as it is predicted to have an increase in market demand. It is also one of the superior commodities that will be developed nationally. Nevertheless, the predicted increase in market demand has not been used well by mango farmers. Cultivation of mangoes are still facing many problems: management that has not been optimally

developed, low quality product with uncertainty in the continuity of production, farming implementation that has not been complied with standardized operational procedures, institutional support for farmers which have not yet formed an optimal way, the partnership that has not been reestablished, farmers' lack of skill in applying technology for maintenance and mango production, harvesting and post-harvesting. Collaboration and coordination among actors have not been going well. Based on those issues, it is obvious that the sustainability of production has not been running well and farmers still do not have a proper bargaining position. There is no harmonization of the roles of actors involved in the mango agribusiness according to values and norms that may have previously been in agreement among actors towards advanced mango agribusiness and production continuity to increase farmers' welfare.

Root Definition

Mango agribusiness cultivation should continue to be developed to ensure the sustainability of the mango production in an effort to meet the demand of both domestic and international markets which predicted to rise by establishing a good and fair partnership entanglement. The attitudes of the actors involved, the skills and culture, especially of mango farmers and stakeholders are considered to be a trigger in production discontinuity which should be controlled by a variety of activities in mango cultivation.

Relevant Modelling System

Formulation of Efficacy, Efficiency, Effectiveness, Ethicality, Elegance (5E)

Formulation of 5E is an activity of evaluation by planning agribusiness activities in the attainment of mango cultivation in accordance with the desired transformation.

Human Activity System (HAS)

In Human Activity System, there is an involvement of activities among the actors of mango agribusiness which is needed to reach transformation process, namely to increase production sustainability through proper and fair partnership (Fig.3.).

Table 3. Formulation of Efficacy, Efficiency, Effectiveness, Ethicality, Elegance (5E)

No	Aspect of	Formulation
1	*Efficacy*	Coordination and transparency of all actors involved in mango agribusiness
2	*Efficiency*	Mango cultivation activities are in accordance with standard operating procedures (SOP) of the proper mango cultivation
3	*Effectiveness*	Mango cultivation is optimally planned to ensure the implementation of a complete mango agribusiness system
4	*Ethicality*	Mango agribusiness management through farmer groups does not reduce the rights of farmers to determine their mango cultivation
5	*Elegance*	Activities in mango cultivation optimally carried out with consideration of the principle of production sustainability to achieve the desire transformation

Source: Primary data, 2014, Processed

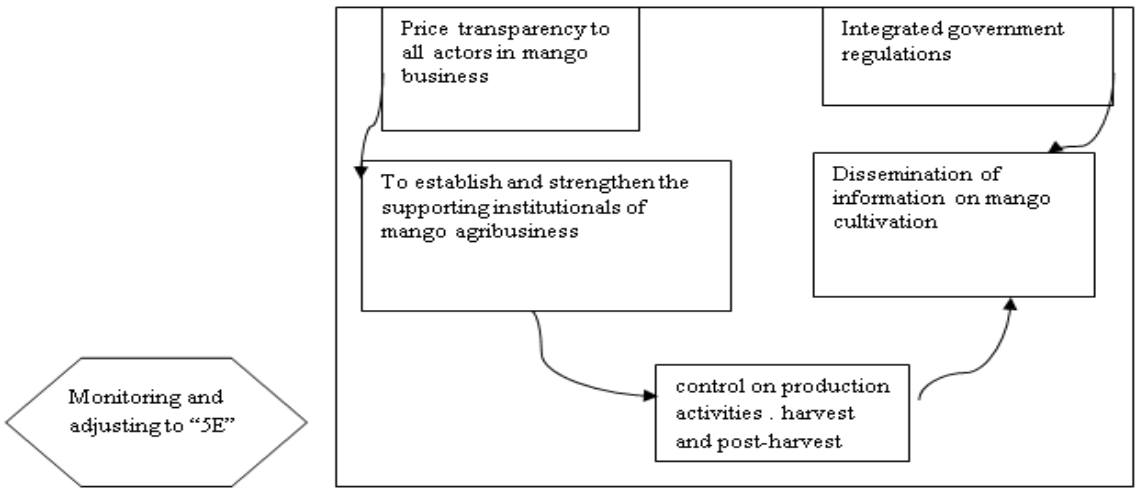


Fig. 3. Human Activity System (HAS) in Mango Agribusiness
Source: Primary data, 2014, Processed.

Table 4. Comparison of Model with the Reality

Activities on the Model	Yes/ No	How	Who?	Good/ Bad?	Alternative
Transparency of prices to all actors of mango business, mainly farmers	No	Farmers through farmer groups involved in determining the price, but at present farmers are never involved in price determination done by traders or wholesalers	Farmer, farmer groups, traders or wholesalers	Good	Involvement of mango farmers in pricing after purchase and sale agreement, especially after farmers were given loan by the wholesalers
To control the maintenance activities, production, harvest, and post-harvest	Not	Farmers through farmer groups have to make sure that production process is done according to the standard operating procedures (SOP)	Farmers, farmer groups, traders (collector), wholesalers	Good	There should be re-establishment of partnerships with industry
To establish and strengthen the supporting institutional in mango agribusiness	Currently no	There is agreement to form a cooperative to support mango business activities	Farmers, farmer groups, local-government	Good	
Integrated government policy to all actors involved in mango agribusiness	No	Government's policies and regulations should support the development of mango agribusiness as a complete system	Farmers, farmer groups, traders, local-government	Good	
Dissemination of information and technology related to mango agribusiness	Yes, it exists	There should be a motivation to hold a meeting between farmers and farmer groups to apply the technology according to SOP	Farmers, farmer groups, the government, (the relevant offices/ agencies)	Good	Guidance for farmers from related agencies to implement the production technology, maintenance, harvesting, and post-harvest

Source: Primary data, 2014, Processed

Table 5. Formulation Changes Process of SSM on Mango Agribusiness Cultivation

Activities	Is it necessary?	Is it can be done?	Possibility of Real Action
Transparency of prices to all actors involved in mango businesses	Yes	It can	Coordination among parties involved should be optimized in maintaining justice/fairness for all
Procurement of agricultural inputs, especially for fertilization and pest control plant diseases managed by farmer groups through cooperation with companies supplying inputs	Yes	It can	To optimize the coordination and collaboration between farmer groups and companies supplying inputs
To establish and strengthen the supporting institutions of mango agribusiness	Yes	It can	Motivated to form a cooperative as bridging facilities of farmers in managing saprotan (agricultural inputs), capital, development, and implementation of technology through the adoption of innovation to improve mango agribusiness better
Control of activities on maintenance, production, harvest, and post-harvest	Yes	It can	Involving farmers, farmer groups, cooperatives (soon to be formed), universities, companies inputs, related agencies which would be more active in their role to perform optimal and intensive coaching and mentoring Through collaboration and coordination among relevant parties which can motivate farmers to implement the technology with proper SOP and apply that technology for sustainability of production
Integrated relevant government policies and regulations in the system of mango agribusiness	Yes	It can	Consultations and hearings of farmers, farmer groups and parties involved in related activities of upstream and downstream of mango businesses, viewed from the needs and policies, and also a proactive of government role to this activity. Coaching and motivating to re-establish a partnership with industrial firms. Policies on financial management through access to capital for mango farmers Policies to access mango market
Dissemination of information and technology related to mango agribusiness	Yes	It can	Optimizing a meeting among the parties through coaching, mentoring, counseling, guidance, seminars on optimizing business management Optimization of the coaching and mentoring in technological innovation according to SOP Guidance and advisory services related to management of the stock in the warehouse to maintain continuity of supply

Source: Primary data, 2014, Processed

Model Comparison with the Reality

Stakeholders or actors involved in mango agribusiness perform a comparison of the conceptual model between human activity system with the reality.

It can be seen in a variety of questions in Table 4.

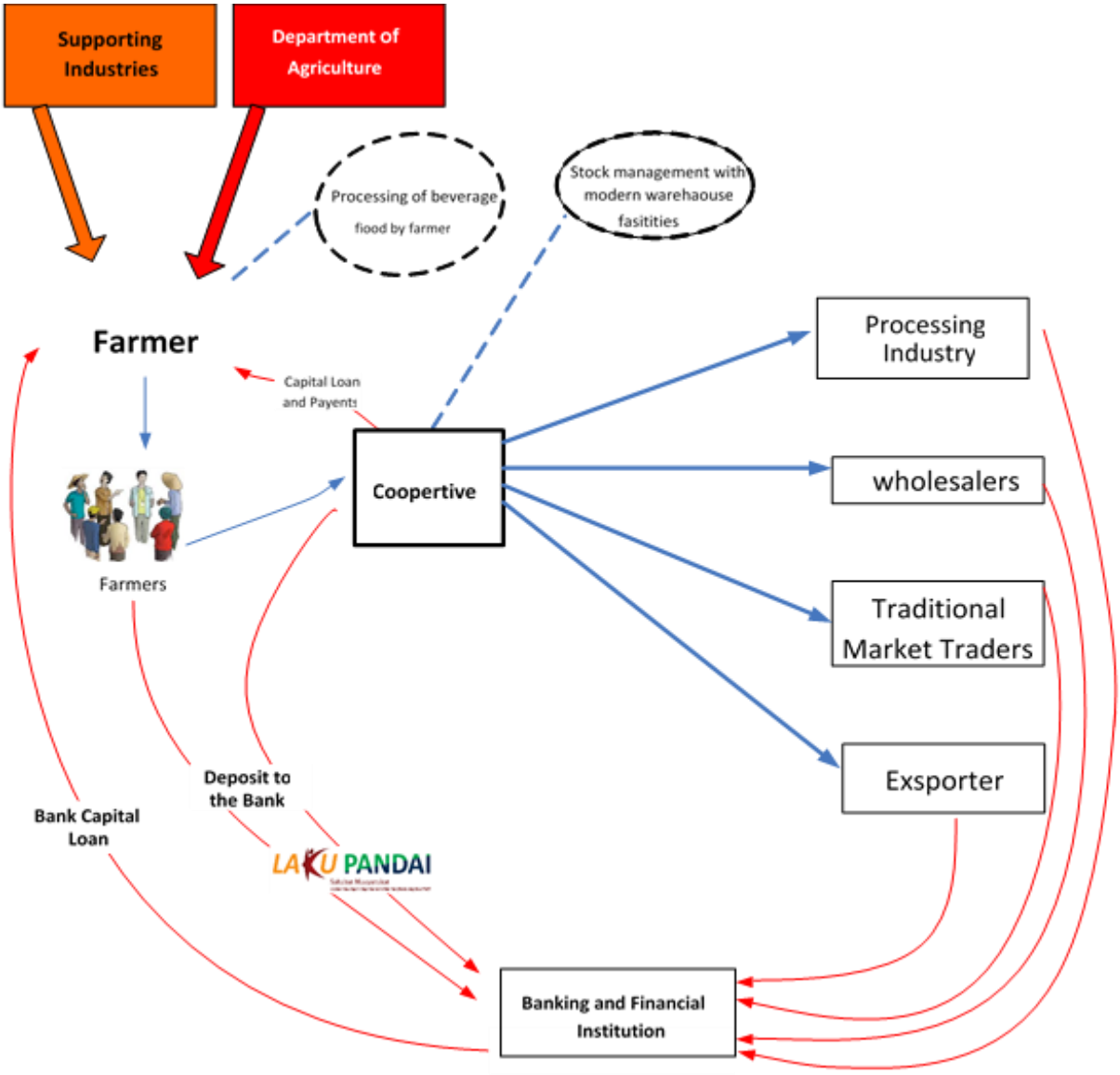
Formulation Changes

By examining the phenomenon in the reality/reality and overviewing rich picture, some formulations of the desired changes which considered culturally relevant and

proper, meaningful and considerably meet the needs of stakeholders were obtained [3]. These changes can be carried out by the stakeholders involved in mango agribusiness. They can be seen in Table 5.

Taking Actions and Implications Research

Based on the analysis and assessment of the stakeholders either as actors and parties involved in mango agribusiness and have also been through a description of: (i) rich picture, (ii) cultural analysis of stakeholders and decision makers, (iii) the definition system of relevant/CATWOE, (iv) modelling system relevant to the concept of human activity system (HAS), (v) comparison of conceptual model with the reality, (vi) the formulation of improvement. The final stage of activities or business actions submitted to stakeholders of mango agribusiness cultivation.



Note: Laku Pandai**:** Financial Service Authority (FSA) service model (without office).

Fig. 4. Development model of mango agribusiness

Source: Primary data, 2014, Processed

Actions to improve this business activity is proposed as attempts of mango production sustainability to be continuously fulfilled the market demand, which is predicted to increase by serving better quality through the reestablishment of a partnership. Figure 4 shows the optimized development model of mango agribusiness cultivation in an attempt of supply continuity.

There is a good expectation in Figure 4, for optimal development of mango agribusiness cultivation with better management through the establishment of a cooperative. Cooperatives can facilitate mango farmers' need in the procurement of agricultural inputs for his mango farm maintenance activities, including the procurement of capital. Cooperatives can also be expected as a bridge to access the structured market thereby facilitating the re- establishment of a partnership with the industry. The existence of cooperatives and partnership can be functioned as a medium to avoid the delayed payment which often occurs recently. Collaborative strategy is one of the strategies in the development of a business including mango agribusiness. Collaboration will harmonize the supply chain process in creating success value of customer and stakeholders rather than individually conducting business activities [8]. Related parties such as Department of Agriculture, Department of Industry and Trade Services, universities, farmer groups and cooperatives, banks and others should be able to collaborate to achieve more optimal mango agribusiness with their respective roles.

In realizing the continuity of production, mango farmers can apply the *off season* technology with the guidance and assistance of the supporting parties, and should also be accompanied by stock management to balance the product supply in fulfilling market demand. Mango processing should also be further enhanced by mentoring or coaching from related agencies or universities in order to actualize the adding value for mango farmers. Mango sorting post-harvest activities are carried out in the cooperative for sorting *grade* according to the market segment of interest so that the off grade mango can be used for the processing.

To facilitate the financial service activities in the community, the Financial Service Authority (FSA) issued a regulation No.19/POJK.03/2014 e.g. *Laku Pandai*, a financial service without an office in the context of inclusive finance, which provides financial products that reachable, simple, and suit the needs of the community such as deposit cash and cash withdrawal. *Laku Pandai* is FSA program for the provision of banking or other financial services through cooperation with other parties (bank agent) and supported by the use of information technology facilities. The program aims to provide financial products that are simple, easy to understand, and in accordance with the needs of people who have not been able to reach financial services. It is also launched the economic activities to encourage economic growth and equitable development among regions in Indonesia, especially in rural and urban areas. If farmers want to save their money or do the withdrawal for mango cultivation needs, they simply come to *Laku Pandai* agent, someone who is willing to be an agent and comply with the rules of banking agent who appointed him/her, so that it will ease the service of farmers in financial access.

CONCLUSIONS

Farming/cultivation of mango agribusiness in Majalengka is still not optimally managed, whereby the coordination and collaboration among actors of mango businesses have not well performed.

Based on the formula changes that must be implemented in the mango agribusiness cultivation, among which are: the optimization of inter-party coordination and collaboration through active control activities of intensive coaching and mentoring, dissemination of information and technology related to the implementation of technological innovation in supporting the mango supply continuity in the market.

The development model of mango agribusiness should be integratedly performed by various

parties involved and supported by government regulation.

This study allowed to make the following recommendations:

(i)In mango agribusiness cultivation, it is expected to re-establish the partnerships with industry or structured market through the principle of justice so as to motivate the mango farmers to maintain the quality and continuity of mango supply.

(ii)The establishment and strengthening cooperatives as facilities for farmers in realizing agribusiness systems must be done properly and fairly.

(iii)Through institutional cooperatives or farmer groups, mango farmers are advised to apply corrective measures in accordance with the formulation of the SSM process improvement.

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FOOD INSECURITY STATUS AMONG FEMALE HEADED HOUSEHOLDS IN NIGERIA

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Abstract

Previous studies have established high food insecurity status among women compared to their male counterpart. Thus, this study examined the factors responsible for the high level of food insecurity status among female headed households in Nigeria. Secondary data obtained from Harmonized Nigeria Living Standard Survey (HNLSS) conducted by the National Bureau of Statistics (NBS) was used for the study. Information from four thousand nine hundred and seventy nine (4,979) households was used for this study. The analytical techniques adopted include descriptive statistics, Foster Greer and Thorbeck and Tobit Regression Model. The results showed that most of the female headed households' ages lie within the range 18-60 years and 66.62% of the household were predominantly in the rural sectors. Findings revealed that 59.1% of female headed households are food insecure. Identified determinants of food insecurity among female headed households include: age of household head, household size, gender and marital status. Food availability remained below the required levels for larger parts of the rural populace identified. It is recommended that group specific safety net measure directed towards the food insecure female headed households who are predominantly widows should be an option in tackling food insecurity.

Key words**:** *female headed households, food insecurity, tobit regression and Nigeria*

INTRODUCTION

Gender differences in resource control, asset ownership, income earning, consumption and expenditure have been identified as important factors in household`s food security [17].
Gender is especially important to food security, as women and men have different roles and resources when it comes to food production, different decision-making roles over food consumption and nutrition, and different coping skills when it comes to emergencies. Food security exists when all people, at all times, have physical, social, and economic access to the sufficient food which meets their dietary needs and food preferences for an active and healthy life [9]. Food insecurity on the other hand refers to a country's inability to provide and secure high quantity and quality of food to its people as a result of high demand, shortages in the supply of agricultural commodities, and low purchasing power [1]. Food security of a nation may be affected by decline in agricultural commodity output, population growth and trade liberalization which leads to elimination of subsidies on agricultural inputs and trade restrictions [2].
Although women play significant roles in agriculture and food security in many developing countries, they continue to have a poorer command over a range of productive resources, including education, land, information, and financial resources [15]. In 2009, the UN estimated that 60 percent of the world's chronically hungry people are women and girls, 98% of which live in developing nations, when women have income, substantial evidence indicates that the income is more likely to be spent on food and children's needs. Women are often responsible for providing food to their families both in female-and male-headed households, they generally have less access to land than men, less access to education, and are expected to carry most of the burden for housework and childcare.
According to [7], female headed households were indeed more vulnerable to food insecurity than male headed households. Despite improvement in women`s capabilities, gender gaps in entitlement, the resources which

women and men can command through available legal means, continue to persist [4]. This is usually reflected in unequal right between men and women for both natural and physical capital which leads to inadequate and appropriate use of resource, and limited alternative`s, low income, poor diet and low standard of living.

Women play many roles in land use, production, distribution, processing, marketing accessing, trading and food availability. They often work as unpaid and self-employed workers on and off farm employees, entrepreneurs, traders, providers of services and caretakers of children and elderly, women farmers represent more than a quarter of the world population, comprising on average 43 percent of the agricultural workforces, ranging from 20 percent in Latin America to 50 percent in Asia and sub-Saharan Africa.

Reducing gender inequality and recognizing the contribution of women to agriculture is critical to achieving global food security. There is consistent and compelling evidence that when the status of women is improved, agricultural productivity increases, poverty is reduced and nutrition improves.

The main objective of this study is to examine determinant food insecurity status among Female-Headed Households (FHH) in Nigeria.

MATERIALS AND METHODS

The study area is Nigeria. Nigeria is made up of 36 States and the Federal Capital Territory (FCT), Abuja. It has 774 Local Government Areas (LGAs) [14]. Nigeria is located in West Africa on the Gulf of Guinea between Benin and Cameroon and lies between latitudes 4º 1‟ and 13º 9‟ N and longitudes 2º 2‟ and 14º 30‟ E. It has an area of 923,768 square kilometers and shares borders with Cameroon in the East, Chad in the Northeast, Niger in the North, and Benin in the West. Nigeria's climate is arid in the North, tropical in the center, and Equatorial in the South. Mean maximum temperatures are 30º C–32º C in the South and 33º C–35º C in the North. High humidity is characteristic from February to November in the South and from June to September in the North while low humidity coincides with the dry season. Annual rainfall decreases Northward and rainfall ranges from about 2,000 millimeters in the coastal zone (averaging more than 3,550 millimeters in the Niger Delta) to 500–750 millimeters in the North.

Data collection

Secondary data obtained from the Harmonized Nigeria Living Standard Survey (HNLSS) conducted by the National Bureau of Statistics [13] comprising of 4,979 female headed households was used for the study. Other sources of information were from journals, books and publications.

Methods

Descriptive statistics was used to examine the socio-economic characteristics of the households in Nigeria and to profile the food insecurity status of the respondents by selected socio-economic variables. The descriptive tools used include means, frequencies and percentages. Foster Greer and Thorbeck measure of food insecurity which has been found to be widely used in several empirical studies ([10]; [8]; [16]) was used to estimate the food insecurity line for rural households in Nigeria.

Hence, the food security line was estimated as the two-thirds of the mean-per capita yearly expenditure on food of all households. A food insecure household is that whose per-capita yearly food expenditure falls below two-thirds of the mean yearly per-capita food expenditure while a food secure household is that whose per-capita yearly food expenditure is above or is equal to threshold. Adopting the method of estimation of the Foster, Greer and Thorbecke poverty index, the food security index was estimated as:

$$P_{\alpha_t} = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{Z - Y_i}{Z}\right]^{\alpha}$$

Z = food security line (2/3 mean per-capita food expenditure)

q = number of households below the food security line

n = total number of households in the population

yi = per capita food expenditure in increasing order for all households

α = is the aversion parameter that takes values of zero, one or two.

Setting α equal to zero, P^o is the head count index measuring the incidence of food insecurity. That is, the proportion of food insecure people from the total population. Setting α equal to one.

P^1 is the food insecurity gap, measuring the depth of food insecurity. That is, on the average, how far the food insecure households are from the food security line.

Setting α equal to two, P^2 is the severity of food insecurity among households. That is, the depth of food insecurity and inequality among the poor.

Regression Model

Tobit regression model was adopted in analyzing the determinants of food insecurity status among female headed households in Nigeria. The tobit regression model follows normal distribution with a homoscedastic error component [11].

A food poverty line (FPL) was constructed to disaggregate the households into food secure and food insecure group.

The regressand takes the value '1' and '0' for food secure and food insecure households respectively.

The tobit regression model follows normal distribution with a homoscedastic error component [11].

The model is specified below

$Y_i^* = \beta_1 X_i + e_i$ ..... (1)

$Y_i^* = Y_i$ if $0 < Y_i < 1$..... (2)

$Y_i^* = Y_i$ if $Y_i = 0$..... (3)

Where Y_i^* is the limited dependent variable which represent food insecurity gap of households

Y_i =the observed dependent (censored) variable

X_i=the vector of independent variables

β= vector of unknown parameters

e_i= disturbance term assumed to be independently and normally distributed with zero mean and constant.

The explanatory variables included in the model are:

X_1=Marital status (1 if married; 0 otherwise),
X_2=Age of household head (Years)
X_3=Household size (Number),
X_4=North-Central (1, if Yes; 0 otherwise),
X_5=North-East (1, if Yes; 0 otherwise),
X_6=North-West (1, if Yes; 0 otherwise),
X_7=South-East (1, if Yes; 0 otherwise),
X_8=South-West (1, if Yes; 0 otherwise),
X_9=Rural(1, if yes; 0 otherwise)
X_{10} = Sector (Rural = 1, urban = 0)

RESULTS AND DISCUSSIONS

Socio-Economics Characteristics of Households in Nigeria

The study revealed that 0.32% of the female headed households in Nigeria was within 1 – 18 years of age, while 64.95% fell within the age range of 18 – 60 years.

About 34.73% are 60 years and above. Most households in the rural areas (65.18%) and urban areas (64.50%) falls within the age range of 18-60 years of age.

This indicates that most of the female headed households in Nigeria lie within 18- 60 years suggesting that the female headed household in Nigeria were predominantly in their middle age and are independent.

Result revealed that 23.20% among the female headed household in Nigeria were married monogamous, 1.37% were married polygamous.

A greater percentage, (62.66%) are widows. Similar trends were obtained in the rural and urban areas in which 64.88% and 58.42% of the rural and urban female headed households had lost their husbands.

This could be a germane reason why food insecurity is high among the female headed households in Nigeria.

Majority of the respondents in Nigeria (71.46%) and across rural and urban sectors (70.03% and 74.31%) respectively have a household size of 1-3 members, with the mean household size being 3 persons.

Households' food insecurity status across sectors

Result showed that 51.90% of female headed households in Nigeria are below the food security line. In the urban sector, 53% of the households were food insecure, which is 1.6% higher than those in rural sector. This is in contrary with the findings of [12] that most food insecure households live in the rural area.

Though there is no significant difference in the food insecurity status between rural and urban households, the latter is, however, higher than the former (Table 2).

Households' per capital expenditure on food across sectors

The per capita expenditure on food in the pooled data is ₦38849.73. Mean per capita expenditure on food in the rural sector was ₦37930.85 while ₦ 40683.64 was expended on food in the urban sector. This revealed that urban households spent more on food than their rural counterpart in Nigeria.

Table 1. Socioeconomic characteristics of respondents

Variables	Pooled		Rural		Urban	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Age						
<18	16	0.321	12	0.362	4	0.241
18-60	3,234	64.953	2,162	65.179	1,072	64.501
>60	1,729	34.726	1,143	34.459	586	35.259
Mean	54.20305					
Standard Deviation	16.65002					
Marital Status						
Married Monogamous	1,155	23.197	744	22.430	411	24.730
Married Polygamous	68	1.366	33	0.995	35	2.106
Living Together	76	1.526	51	1.538	25	1.504
Divorced/separated	560	11.247	337	10.160	223	13.418
Widow	3,120	62.663	2,152	64.878	968	58.243
Household Size						
≤3	3,558	71.460	2,323	70.033	1,235	74.308
4-6	1,152	23.137	799	24.088	353	21.239
>6	269	5.403	195	5.879	74	4.452
Mean	2.787508					
Standard Deviation	1.944343					

Table 2. Households' food insecurity status across sectors

ALL		RURAL		URBAN		T-value
Food Secure	Food Insecure	Food Secure	Food Insecure	Food Secure	Food Insecure	RU-UR
0.481	0.519	0.486	0.514	0.470	0.530	5.34

Table 3. Per capita food expenditure across sectors

	All	Rural	Urban
	Yearly expenditure per adult equivalent (₦)	Yearly expenditure per adult equivalent (₦)	Yearly expenditure per adult equivalent (₦)
Food	38849.73	37930.85	40683.64

Determinants of households' food insecurity status

The result of the Tobit Regression Model revealed that Sector, household size, North East, North West, South East, and South-South are significant at 1% level of probability and were the factors determining food insecurity status among female headed households in Nigeria. The food insecurity status of female headed households, increased by 0.308, for female headed households residing in the rural sector relative to those in the urban sector. This indicates that respondents in the rural sector have higher proportion of food insecure households than those in the urban sector. This is in consonance with the work of [5] who reported that, there are overwhelmingly large proportions of Nigerians who are food insecure that spread across both urban and rural

communities, though most of the foods insecure are found in the rural areas.

Table 4. Determinants of Households' Food Insecurity Status using Tobit Regression Model

Food insecurity determinant	**Coefficients**	**T value**
Sector	.3080876	5.34***
Household Size	.3350534	26.30***
Household Age	.0007081	0.41
Marital status	-.025343	-0.43
North Central	-.1364856	-1.52
North East	-.6454686	-5.20***
North West	-.4209082	-3.33***
South East	-.827433	-11.63***
South South	-.4189578	-5.67***
Constant	-1.577032	-12.56***
Sigma	1.704543	
LR chi2 (9)	751.71	
Prob > chi2	0.0000	

Household size was significant and positive related to food insecurity. This is an indication that an additional member to a household would increase respondents' food insecurity status by 0.335; implying that increase in household size favours female headed households' food insecurity. The result showed consistency with the findings of [7], [16] and [6] which revealed that the impact of large family size is such that it reduces the per-capita food expenditure of the family thereby aggravating food insecurity in that household. Thus the incidence of food insecurity increased with increase in household size.

Food insecurity status is reduced by 0.645, 0.421, 0.827 and 0.419 for female headed households residing in North East, North West, South East, and South-South zones relative to those in the South West zone. The implication of this is that respondents in these zones are more food secure than those in South-West zone. This may probably be due to the impact of social safety nets programs targeted towards women in the northern zones.

CONCLUSIONS

Most of the female headed households were in the age range of 18-60 years and had household size of 1-3 members. Study revealed that 51.90% of female headed household in Nigeria is below the food security line. Also, 51.40% of the rural population of female headed households is food insecure. The urban sector, however, had 53.01% of its population of female headed households being food insecure. The study has shown that the incidence of food insecurity is not only prevalent among rural households but also applicable to the urban sector. Factors that affect food insecurity status in Nigeria among female headed households are household age, household size, marital status and sector.

Based on the findings from the study, the following are recommended:

-Since food insecure respondents cut across both rural and urban sectors, a holistic food policy measure should be adopted to tackle the food insecurity scourge among female headed households.

-Identified food insecure female headed households who are predominantly widows should be specifically targeted for safety nets which could be in form of income smoothening policy measure

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PLUTELLA XYLOSTELLA PARASITOID PARASITATION TYPE AND PERCENTAGE ON CABBAGE VEGETABLE FARM, IN RURUKAN AREA, TOMOHON, INDONESIA

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Abstract

Parasitoid organism was act as biological pest control, in pest attacked on a farm, and Plutella xylostella is one of the pest in cabbage at Rurukan vegetable farm, Tomohon, Indonesia. The observation on the type and percentage on parasitation of Plutella xylostella on cabbage was done at IPM (integrated pest management) area and Non-IPM area. Results indicated that there This parasitoid is solitary and endoparasit, because there is only one parasitoid for one pupa host. The parasitoid rate of D. semiclausum on P. xylostella pupa at IPM area is 83.15% and at Non-IPM area is 70.82%. This results means that D. semiclausum parasitoid was settled at vegetable farm at Rururkan, Tomohon, Indonesia, so there is no need special treatment on P.xylostella pest control.

Key words**:** *cabbage farm, parasitoid, pest control, Plutella xylostella, Diadegma semiclausum*

INTRODUCTION

The development of cabbage vegetable farming in Indonesia was common, but the national average product still low. In North Sulawesi, the cabbage production is not memuaskan, because the farming system still in conventional system, and the pest especially *Plutella xylostella* and *Crocidolomia binotalis* still dominated [10].

Until now the pest control in Indonesia, especially in North Sulawesi, is one species of parasitoid on *P. xylostella*, the *Diadegma semiclausum* (Ordo Hymenoptera, Ichneumonidae Family and Genus *Diadegma*) was acted as pest control.focused on chemically pest control system. Even the pest was attacked, but in was only temporary. Insecticide pest control in vegetables especially to petsay and cabbage, was over dosage in North Sulawesi area [11]. Because of this treatments, there is poisoning the vegetable production, and on the other side, there are pollution. So we must search another system, that is safe and also cheap and good for the environments. We must produce organic vegetables that is pesticide free, develop a healthy agriculture system using biological parasitoid predator.

MATERIALS AND METHODS

Sampling was done at Rurukan area, Tomohon, Indonesia, and the identification at Pest and Entomology Laboratory, Agriculture Faculty, Sam Ratulangi University. The research was conducted between May to June, 2016.

The research used 70% alcohol, plastic bag, rubber band, tissue, aquadestilata, hand counter, scissor, collecting bottle, collecting case, dissecting set, microscope, label.

The research was conducted at farm area, comparing the parasitoid at IPM (Integrated Pest Management) area and non-IPM area/Conventional system. At IPM area, the cabbage was planted using plastic bag, without synthetic insectised and at non-IPM area, they used no plastic bag, but used synthetic insectised.

The parameter of this research are : (a) the type and percentage of parasitoid. Parasitoid stadia, was collected and keep and daily inspection until there are some parasitoid. The imago

parasitoid was indentified. To calculate the parasitation percentage, using [1]:

$$P = \frac{A}{B} X \quad 100\ \%$$

Notes : P = Parasitisation Percentase
a = Sum of parasitisation host
b = Sum of observed parasitisation host

RESULTS AND DISCUSSIONS

Results indicated that there is only one type collected *P. xylostella pupa* sample, and this pupa is a solitary parasitoid and also an endo-parasit, because there is only one parasitoid in one pupa host, and after identification, the parasitoid is one species of parasitoid on *P. xylostella*, the *Diadegma semiclausum* (Ordo Hymenoptera, Ichneumonidae Family and Genus *Diadegma*) [4][8].
The body of female *D. semiclausum* was black-brown color, with yellow stripes at the tungkai. At the front abdomen was black, but at the end is greeny-yellow. The ovipositor is long, looks like a tail. The male imago has also black-brown color, but the tungkai is also brown. The *D. semiclausum* parasitoid was attacked *P. xylostella* at IPM area and at non-IPM area. The morphology of parasitoid *D. semiclausum* imago is on Figure 1.

Fig. 1. The morphology of parasitoid *D. semiclausum* imago

In Table 1, the average parasitisation percentage of *D. semiclausum* on *P. xylostella* pupa, at IPM area, is 83.15 %, and at non-IPM area, only 70.82%.

Table 1. The average parasitisation percentage of *D. semiclausum* on *P. xylostella* pupa in Cabbage Farm

Treatments	Sampling (week)							Average
	1	2	3	4	5	6	7	
	…….. (individual) …….							
IPM	80.0	67.5	90.0	90.5	83.32	84.16	86.6	83.15
Non-IPM	50.0	57.48	83.32	86.66	77.5	62.5	78.32	70.82

According to Table 1, the parasitisation percentage of *D. semiclausum* on *P. xylostella* pupa in Cabbage Farm both at IPM area and non-IPM area, (83.15% and 70.82%) are still high, it means that the *D. semiclausum* was settled at the Cabbage Farm at Rurukan area.
Until 1993, the pest control of *P. xylostella* at North Sulawesi only using Sevin insecticide, and pyretroid insecticed, but at least the pest was auto immune for this insectised, As biological pest control, the *D. semiclausum* was introduced before year 1990, insome area in Indonesia, in Java, Bali and West Sumatra, but the parasitation grade was unsatisfied, because it cannot pressed the population until under the economic ambang batas, [7]. At West Java Province, especially at Pacet area, the trial introducing of *D. semiclausum* was done since 1950. And it was done several times in some area in Indonesia, except in North Sulawesi, and the parasitation was 82% [8]. In North Sulawesi, the first introduction was done since 1990 in Tomohon area, and it was spread successfully, but in 1991, the Mount Lokon was erupted, and the *D. semiclausum* parasitoid was disappeared [12]. So, in 1993 the second introducing with parasitoid from Lembang, West Java, with parasitation percentation between 30-80% [11]. The next

introduction was done in 1994, and the parasitation percentage was 37% [5].

According to Table 1, the parasitisation percentage of *D. semiclausum* was high, both at IPM area (83.15%) and also at Non-IPM area (70.82%) means that the *D. semiclausum* at cabbage farm at Rurukan area, was settled. In cabbage farming at Ethiopia, for three years since introducing *D. semiclausum*, the parasitationn of *D. semiclausum* was increased, and the population of *P. xylostella* was decreased [2]. It means that the pest control to *P. xylostella* is unnecessary using chemical substances, but must use biological agent e.g. parasitoid *D. semiclausum* according to the conservation lingkungan. So, minimalizing the usage of chemical insectised was also a natural conservation [4].

CONCLUSIONS

There is only one *Plutella xylostella* parasitoid, *Diadegma semiclausu* on cabbage farm at Rurukan area, Tomohon.

D. semiclausum parasitation percentage on *P. xulostella* pupa was high, with average 83.15% on IPM treatment and 70.82% on Non-IPM treatment.

D. semiclausum on cabbage farm at Rurukan area, Tomohon was settled, so they need no special treatment, for *P. xylostella* pest control, and *D. semiclausum* as potential biological control agent, must keep maintained.

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LEADERSHIP VERSUS MANAGEMENT IN DESIGN AND BUSINESS CONSULTANCY COMPANIES

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Abstract

In this paper it was developed a comparative approach of the two concepts that refer to the management sphere: management and leadership, trying to emphasize the similarities and differences that exist between them. The main purpose of this paper is to identify the management style applied in a business consultancy company as well as the solutions that can be adopted to improve it. Based on the data from the organization that is the case study, we identified the leadership styles practiced within the company from both a leader and employee perspective. We also conducted a SWOT analysis on leadership identified within the organization to see what strengths, weaknesses, opportunities and threats are on it. Taking into account the results of this analysis, we designed the main solutions that can be applied to develop leadership skills to improve the company's overall performance.

Key words**:** *management, leadership, consultancy, business*

INTRODUCTION

The interest for such studies is explained as leadership, because is a complex concept that has a major impact on organizations' activity, being seen as a "key element" that can make the difference between success and failure. [2]. Many specialists define leadership as "*the process by which a person sets a goal or direction for one or more people and forces them to act with competence and full dedication to achieve them"*.[5] This definition emphasizes the leadership process as a whole, minimizing the role and influence of the leader. Although this approach is correct, it is not complete as it does not indicate how subordinates are determined to act to achieve the set goal. Although the importance of leadership is recognized by most specialists in the field, however, there is no clear and unanimously accepted definition of leadership.[1].

In this context, the notions of "formal leader" and "informal leader" have to be explained. In the specialized literature in Romania, leadership is defined as "*the interpersonal influence exercised by a manager on the subordinates in the process of establishing and especially achieving the objectives"*.[5, 8]. In view of this approach, we have conducted a case study at a company providing consultancy and business management services, focusing in particular on providing specialized assistance to beneficiaries in drawing up projects to obtain European non-reimbursable funds. The main business activity is the "*Research and development in other natural sciences and engineering*", according to CAEN Code 7219. The secondary business activity of the company is "*Business and management consultancy activities*", according to CAEN code 7022.

The company's mission is to become a regional leader in design and consultancy business and to develop new products and services for different sectors of activity (agriculture, beekeeping, economics, marketing) by allocating some of the material, human and financial resources to the research-development activity.

The concept of management is based on assuming responsibility for achieving an objective by allocating resources efficiently to achieve it. On the other hand, the concept of leadership refers to the process of influencing

and directing the members of the organization towards the goal.

MATERIALS AND METHODS

The information on the object of activity, the organizational structure and the registered economic results were obtained from the specialized departments of the consultancy and project management company.
The research method used to identify the leadership style practiced within this company was the investigation, and the main tool for collecting information was the questionnaire.
In order to have a clearer and more objective view on the leadership style practiced in the company, we drew two questionnaires: one for the leader and the other for the employees.

RESULTS AND DISCUSSIONS

The development of leadership skills has a positive impact on the company's activity, helping to maximize its performance by creating an environment auspicious for innovation and creativity, which will also determine the professional development of the employees.
Through this approach, we see a new perspective on leadership that is no longer seen as a mere attribute of management, but a complex phenomenon that involves creating a beneficial emulation within the team, thereby increasing the performance of the organization.
Leadership and management are two complex concepts that refer to the sphere of leadership of organizations, which is why they have created confusion over time. Very often, the two terms are misused and are considered the same. However, looking at the literature, one can notice that there are elements that clearly differentiate the two concepts.
Other specialists, such as Warren Bennis, in the paper "*On Becoming a Leader"*, identify twelve differences between manager and leader.[1] (Table 1).
It can be noticed that the author exaggerated many of the features, greatly diminishing the managerial skills, while the leader seems to be the embodiment of perfection. All these things have been done, however, in order to emphasize that the activity of the manager is formal, typically, while the leader makes new, unique things.

Table 1. Differences between managers and leaders in the opinion of W. Bennis

Features of manager	Features of leader
Manages	Innovates
is a copy	He is original
Maintains	Develops
Emphasizes on systems and structure	Emphasizes on people
Is based on control	Bases on trust
has a short-term perspective	Has a long-term perspective
Answer questions such as "where?", "How?"	Answers questions such as "what?", "Why?"
is guided by immediate results	Looks to new perspectives
Imitates	Creates
is the classic "good soldier"	Has an individual character
Accepts situations he can not influence	Defies situations that he can not influence
Make things "right"	Does the things that are "right"

Source: [1]

The project management team is formed for each project, from the company's employees and eventually in the case of projects with a high degree of complexity and innovation, and from other specialists contracted for such projects. In this respect, the company has collaborative relationships with various companies or individuals authorized to provide technical services (design, architecture, market studies, technological flows).
In order to achieve the above-mentioned goal it was necessary to clarify the following aspects: what activities the company carries out and its managerial performance, what is the organizational structure of the company, what leadership style is applied in the company, what are the characteristics of the style of the leadership practices, what are the strengths and weaknesses of the leadership style practiced and what solutions can be applied to develop the leadership style applied within the company.
The questionnaire addressed to the leader aimed to determine the leadership style based on the leadership grid developed by R. Blake and J Mouton.[7]. The 18 questions addressed to the leader were divided into two series, each

reflecting either task orientation or human orientation.

Each question has been scaled from 1 to 5 as follows: 1 = never; 2 = rarely; 3 = sometimes; 4 = often; 5 = always

Interpretation of results - After completing the questionnaire, the scores obtained in each series were gathered and the results multiplied by 0.2. The score reflecting "task orientation" was represented on the horizontal axis, and the specific "orientation towards people" was represented on the vertical axis.

The Employee Questionnaire includes a set of 36 questions that address four distinct themes specific to leadership: decision, change, team and organization.

The Employee response grid was the following: 1 point if the answer is never; 2 points if the answer is seldom; 3 points if the answer is sometimes; 4 points if the answer is often; 5 points if the answer is always.

The leadership styles taken into account in this questionnaire were autocratic, participatory and democratic, their classification being as follows:

The minimum score that can be obtained: 3x36x1 = 108

The maximum score could be 3x36x5 = 540

For a score ranging from: 108 to 252, the leadership style is autocratic

253-396 leadership style is participatory

397 - 540 leadership style is democratic

The results for each of these themes were calculated using the rating grid shown in Table 2.

Table 2. Employee questionnaire evaluation grid Differences

Leadership style	No of question												Total points
AUTOCRAT	2	6	7	11	16	19	26	30	31	34	35	36	108 - 252
PARTICIPATIVE	3	4	8	9	12	13	17	18	20	22	25	28	253 - 396
DEMOCRATIC	1	5	10	14	15	21	23	24	27	29	32	33	397 - 540

Source: Own determination

The 36 questions have been grouped so that the leadership style used for each of the four directions of action can be identified: decision, change, team and organization. Also, questions were raised about specific skills and defining features for leaders, such as attitude towards change, the level of leadership involvement in the professional development of employees, the ability to manage conflicts within the company, attitudes towards employees, as well as the desire to improve the leader. By analyzing and interpreting the results of the questionnaire, it will be seen whether the leader adopts a unitary leadership style or adapts his / her leadership style to the existing context at one time within the company.

To see what style of leadership is usually applied in the decision-making process of the consulting company. We have analyzed what answers employees gave to questions that relate to how to substantiate decisions. In this respect, two questions were included in the questionnaire reflecting each of the leadership styles previously presented. The answers given by the subordinates are shown in Fig. 1.

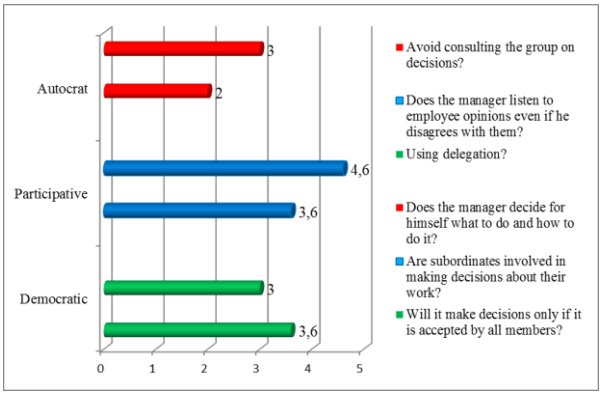

Fig. 1. Leadership style used in the company for decision-making

Source: Own determination

According to the data presented in Fig. 1, the leadership style most often used in the decision-making process is the participatory one, registering an average score of 4.1 points in the maximum of 5, while the democratic leadership style was rated at 3.3 points. This demonstrates that the leader of the business consultancy company knows how to capitalize on the employees' professional experience to find the best solutions to solve the problems the organization is facing.

The **questionnaire addressed to the leader** is made up of a set of 18 questions, half of which focus on tasks, the other half referring to the orientation towards people.

The statements characteristic of concern for humanity were divided as follows:

-The extent to which the leader involves subordinates in the decision-making process is

reflected in the answers given to questions no. 1 and 6.
-The attitude adopted by the leader regarding the professional development of the employees is reflected in the answers to the questions no. 4 and 17.
-The importance the leader gives to the formation of a real team, as well as the way he communicates with the employees, is highlighted by the answers to questions no. 9, 10, 12, 14, and 16 of the questionnaire.
Concerning the statements about the task orientation, these were grouped by taking into account the following aspects:
-The importance given by the leader to the achievement of the objectives is highlighted in the answers given to questions no. 2 and 15.
-The importance of leadership in planning activity is reflected in the answers given to questions no. 3, 7, 11 and 13.
-The organizational capacity of the leader is highlighted by the answers given to questions no. 5 and 8.
-The leader's desire to develop and improve continuously in the field in which he works is reflected in the answer given to question no. 18.
One of the problematic issues that arise when using the questionnaire is given by the fact that, most of the time, people tend to give ideal mistakes, ignoring reality.
The results of the questionnaire completed by the leader are shown in Table 3.

Table 3. Interpreting the results of the questionnaire addressed to the leader

Target orientation		Orientation towards people	
No. question	Score	No. question	Score
2	4	1	4
3	4	4	3
5	3	6	4
7	3	9	2
8	4	10	2
11	3	12	4
13	4	14	4
15	3	16	4
18	5	17	3
Total	33	Total	30

Source: Own determination

Final Score - Target orientation: 33 x 0.2 = 6.6 points

Final Score - Orientation towards people: 30 x 0.2 = 6 points
The results obtained indicate that the leader of the business consultancy company, gives moderate attention to both people and goals, yet being more concerned with managerial performance.
Based on the results obtained by completing the questionnaire for the leader, we have prepared the Leadership Grid for the case study company, as shown in Fig. 2.

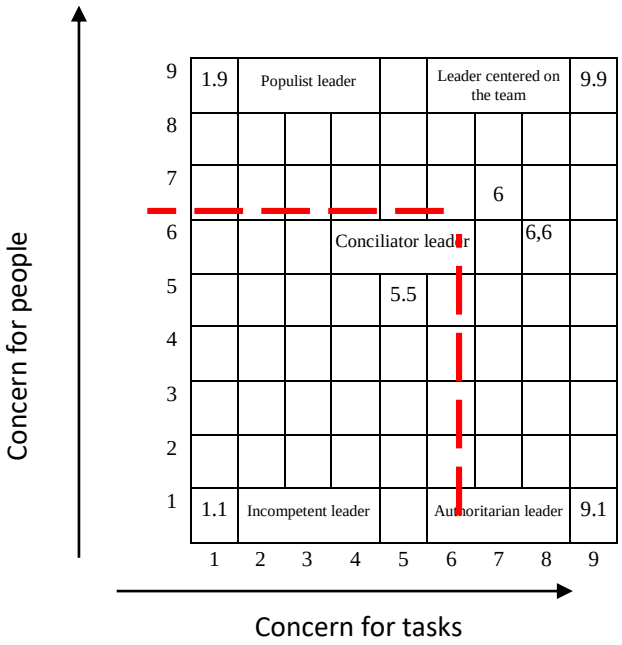

Fig. 2. The leadership grid at the consultancy company
Source: Own determination

As can be seen in Fig. 2, the score indicates that the company's leadership is conciliatory. The characteristic of this type of leadership is that it determines average organizational performance. In this case, the leader gives a constant and balanced attention to both the people and the activity carried out, setting goals of a moderate difficulty that does not cause great problems to the employees. As a rule, this type of leader has very good communication skills and knows how to manage the conflicting situations that may occur within the team.
On the basis of the above, it can be said that the leader of the consultancy company does not practice a unitary leadership style in his / her work, but adopts different leadership styles depending on the situation existing at one point

in the company, trying to make effective use of employee experience to achieve organizational goals.

The main leadership styles adopted by the company regarding the four fundamental elements of leadership are presented in Table 4.

Table 4. Leadership styles practiced within the consultancy company

Directions of action	Style of leadership practiced
Taking decisions	PARTICIPATIVE
Attitude towards change	DEMOCRATIC
Organization of activity	PARTICIPATIVE
Attitude towards team	PARTICIPATIVE

Source: Own determination

The data in Table 4 indicates that the company typically adopts a participatory leadership style in decision-making and organizational work. This means that the leader consults the subordinates before making a decision, which increases the degree of motivation and involvement of the employees in order to meet the organization's objectives. Participatory leadership is applied by the manager and in the relationship with the team, with favourable consequences for both the working environment and the efficiency of the project team. The leader's attitude toward change is a very open one, indicating that the leadership used in this regard is democratic. In other words, the leader stimulates employee creativity to find the most effective solutions to solve problems. This approach creates a favourable framework both for the professional development of the employees and for the development of the organization as a whole.

CONCLUSIONS

Taking into account the characteristics of the activities carried out within the company, we believe that adopting a participatory leadership style contributes to the best performance. Employee consultation on the composition and organization of project teams increases the acceptance of decisions, with a positive impact on both the working environment and productivity.

Both the results obtained by analyzing the questionnaire addressed to the leader and those obtained by interpreting the questionnaire addressed to the employees indicated that the leadership practiced within the company is balanced, with emphasis on both performances and inter-human relations. The results obtained after interpreting the questionnaire addressed to employees, indicates that there is no unitary leadership style in the company but several styles that are tailored to the existing context at one time. However, the leadership style used predominantly is participatory.

Although leadership within the company is a good one that generates performance, we believe it can be improved with programs and leadership courses. Through them, the company leader can acquire the skills needed to create a more attractive vision that employees can identify and make them more motivated in what they do.

A simple, inexpensive, and very effective tool for improving leadership style is feedback. In order to obtain a sincere attitude from employees, it is recommended to create a so-called "suggestion box" in which proposals are anonymous.

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RESEARCHES ON QUALITATIVE AND QUANTITATIVE ANALYSIS, ON DURATION OF STORAGE IN VARIOUS VARIETIES OF APPLES

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Abstract

The research was made in an organic farm, located on a preluvosol soil type with pedoclimatic conditions that support the apple plantations in this area. In this paper, the aim was to establish the capacity to store the fresh fruit quality and to highlight the diseases of the storehouse, of the varieties existing in the grown variety. Six varieties of homologated varieties of apple (Florina, Generos, Golden Delicious, Idared, Jonathan and Redix) were taken into consideration in order to establish the ability to store the apple quality in fresh state. It was found that the lowest total loss, with values below 10%, was registered at V3-Idared (7.45%). This variant presented both low weight losses and depreciation due to disease attack. The same variety also retained its initial firmness with an insignificant difference during storage. At the same time, it was noted that the highest content of initial juice extracted, belongs to V3-Idared and V4-Florina variants with more than 600 ml/kg.

Key words: *apples, quality, storage, depreciation, firmness, varieties, juice.*

INTRODUCTION

The quality concept for fruit is a complex and current notion, which can be analyzed under the following aspects: organoleptic, commercial, nutritional agronomic and sanitary [15], [1].

Fresh fruit supply is an aspect of great importance, due to the growing demands of horticultural products by the consumers.

The high nutritional value of fruit, especially apples, and the long period of time that they can cover, cause high consumption among the population [6].

According to the state of the products and methods used, the fruits are recovered in a fresh state and in processed state (totally or partially) [4], [10]. The contribution of apples for consume is higher when they are consumed in the fresh state [6], as a consequence, maintaining unchanged food value is an important problem of using [11], [3]. Apples are some of the fruits that if they are properly stored can cover consumption throughout the year [2]. In order to keep their food value and commercial aspect, the storage conditions are of the highest importance [14].

Following the process of fresh unfermented fresh products pressing, some of the apple production is transformed into fruit juice [13], [12]. A special interest in the preparation of juices is the retention in the finished product of all the nutritional and taste qualities of the fruits [8], [16].

MATERIALS AND METHODS

In order to establish the capacity of keeping the apples quality in fresh state, six homologated varieties of apples were taken into consideration in the study: Florina, Generos, Golden Delicious, Idared, Jonathan and Redix. The apples were stored and preserved in plastic boxes, in cold conditions with controlled atmosphere.

After 150 days of storage determinations were made related to:

- the level of quantitative and qualitative losses;
- changing fruit consistency (firmness);
- fruit juice content;

The experiments were organized in 6 comparative variants, of 3 repetitions for each variant. During storage, daily control of the

thermo-hydro factors in the refrigeration room was performed in order to ensure that the optimal conditions for quality maintaining were observed.

During storage, the apple quality maintenance capacity was assessed, with findings on aspect changes related to dehydration and the occurrence and evolution of various storage diseases [9].

After the removal of the apples from the storage space, determinations were made regarding the level of the quantitative and qualitative losses registered by the fruits, the change of the firmness of the fruit (determined by penetrometry), the determination of the changes in the juice content.

The determination of weight losses by spoiling during the retention period was done by weighing the resulting fruit samples, respectively the spoiled, rotten (diseased) fruit compared to the initial stored quantities, the results being expressed as a percentage.

The determination of the pulp juice content was made at a number of 25 fruits of each variant. The juice extraction was made by means of a centrifugal laboratory juicer, the amount of juice extracted being related to the pulp weight of the fruits introduced in the juice extraction process and expressed in ml/kg and g/kg.

The fruit firmness was determined with a manual penetrometer, Effe-gi type, with large piston with 11 mm diameter, at a number of 25 fruits per variant, each fruit being penetrated in 4 points in the equatorial area after removing the epidermis in the penetration areas.

RESULTS AND DISCUSSIONS

The researches made, aimed to establish the capacity of maintaining the fruit quality in fresh state, the apples firmness when storing in storehouse and the evolution of the changes in the apple juice content during storage.

Evolution of fruit firmness during storage

In Table 1, data on the firmness of apples during storage is shown, so it is found out that when refrigerated storage, the studied apple varieties showed a different degree of pulp consistency. The highest firmness was determined at V4-Florina (6.40 kgf/cm²), and the lowest at V1-Jonathan (3.38 kgf/cm²).

The average of the 6 variants was 4.17 kgf/cm². During storage, the firmness of apples decreased to most variants in different percentages ranging between 3.89 kgf/cm² (V5-Redix) which registered the lowest firmness and 4.62 kgf/cm²) at V6- Golden Delicious, with the best firmness. Variety V1-Jonathan showed increase of 15.50% after the storage period, the firmness of the fruit being of 4.00 kgf/cm²).

Table 1. Apples firmness during storage and after storage

Variant	Penetration value (kgf/cm²)				
	Variety	On storage	After storage	Differences	
				Kgf/ cm²	%
V1	Jonathan	3.38	4.00	+0.62	+15.50
V2	Generos	4.79	3.91	-0.88	-22.50
V3	Idared	4.46	4.38	-0.08	-1.82
V4	Florina	6.40	5.21	-1.19	-22.84
V5	Redix	4.50	3.89	-0.61	-15.68
V6	Golden delicious	4.87	4.62	-0.25	-5.41
	Average	**4.17**	**4.35**	**-1.19**	**-8.79**

Source: Own determinations

The fruit firmness at the end of the storage period was contained between 3.89 kgf/cm² (V5-Redix) and 5.21 kgf/cm² (V4-Florina), with an average of the 6 variants of 4.35 kgf/cm², value with 8.79% more reduced than the initial one.

From all variants, V3-Idared maintains the same firmness of the fruit during their storage,

the difference of fruit storage being insignificant.

Changes in the content of apple juice during storage.

The initial content of apple juice extract is contained, according to volume, between 549-630 ml/kg, and the juice weight, between 609-680 g/kg.

The apples with the highest initial juice extract content belong to the V3-Idared and V4-Florina variants, with over 600 ml/kg. The lowest juice content was registered with V2-Generos (549 ml/kg).

During storage, the apple juice content changed, volumetrically, increasing on average by 8.08% and the weight by 6.40%, existing also the V6-Golden delicious variant, where the juice content showed a decrease of 7.94% (Table 2).

Table 2. Volume of apple juice per extraction before and after storage, related to the pulp

Vari-ant	Variety	Volume (ml/kg)		
		Initial	final	dif. (%)
V1	Jonathan	573	641	+10.60
V2	Generos	549	660	+16.81
V3	Idared	630	680	+7.35
V4	Florina	612	666	+8.10
V5	Redix	580	671	+13.56
V6	Golden delicious	571	529	-7.94
Average		**586**	**641.16**	**+8.08**

Source: Own determinations

Table 3. Weight of apple juice on extraction before and after storage, related to pulp (net)

Vari-ant	Variety	Weight (g/kg)		
		Initial	final	dif. (%)
V1	Jonathan	618	652	+5.21
V2	Generos	609	679	+11.12
V3	Idared	680	707	+4.12
V4	Florina	655	673	+2.90
V5	Redix	611	678	+11.33
V6	Golden delicious	638	664	+3.75
	Average	635.16	675.5	+6.40

Source: Own determinations

Table 3, shows the weight loss of the apple juice during storage, where the largest losses are in V5 - Redix variety (11.33%), losses related to the volume, followed by losses from the variety V2 - Generous, with a difference of 11.12%, from the initial moment of storage.

Qualitative and quantitative losses, registered at fruits during storage, at the 6 variants.

From the data shown in table 4, it results that in apples, the total losses during storage are contained between 6.89 % - 80.12 %, with an average of 34.55 %. The weight losses range between 4.05–10.76 %, with an average of 7.67%, and the spoiled ones between 3.33–69.87%, with an average 27.49 %.

Table 4. Losses registered during apple storage

Vari-ant	Variety	Losses (%)		
		Total	Weight	Spoiling
V1	Jonathan	35.11	5.59	28.07
V2	Generos	19.92	10.01	10.85
V3	Idared	6.89	4.05	3.33
V4	Florina	15.28	6.88	8.95
V5	Redix	50.02	8.73	43.91
V6	Golden delicious	80.12	10.76	69.87
Average		**34.55**	**7.67**	**27.49**

Source: Own determinations

The lowest total losses, with values under 10% are registered at V3-Idared (6.89%), this variant shows both low losses and depreciations due to the diseases attack.

V6-Golden delicious variant shows the largest total loss by spoiling (80.12%), research with similar losses was reported and confirmed by other researchers [7].

The lowest weight losses were determined for V3-Idared fruit (3.33%), and the highest weight losses were registered at V6-Golden delicious and V2-Generos (10.76%), compared to the average of 7.67%. The apple variety that registered the lowest loss is Idared, and the least resistant to the storage was Golden delicious variety.

Losses on the whole by spoiling shown a high level with an average of 27.49%. The lowest loss by spoiling, with values below 10%, was determined at V3-Idared, followed by V4-Florina (8.95%), concluding that these two varieties: Idared and Florina, are the most resistant to spoiling.

The highest losses by spoiling were determined at V6-Golden delicious (69.87%), percent that increased three times compared to the spoiling average of these 6 varieties (27% 49%). And

V5 – Redix variant shows spoiling conditions quite frequent, compared to the average.

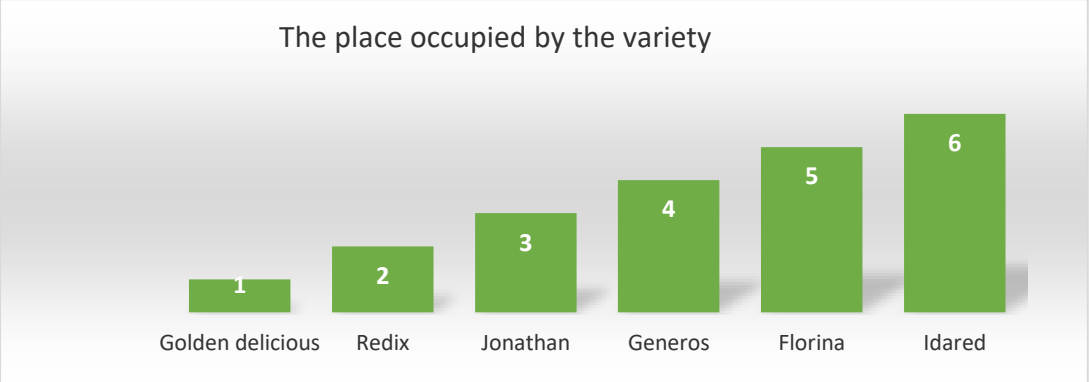

Fig. 1. The place occupied of each variety, depending on the losses registered during the apple storage
Source: Own determinations

CONCLUSIONS

The presented conclusions refer to the results obtained following the experiments made on the fruit in the harvest of 2015-2016, with the specific climatic conditions of this period.

In apples, total losses during storage were between 6.89 to V3 - Idared and 80.12% to V6 - Golden delicious, with an average loss of 34.55%.

The weight losses were between 4.05 (Idared) and 10.76% (Golden delicious), with an average of 7.67%, and the losses by spoiling were between 3.33 - 69.87%, at the same varieties, with an average of 27.49%.

Idared and Florina varieties showed a low total loss due to the low level of weight losses and depreciation during storage. Very large losses were registered in the Golden delicious and Redix varieties, with a high level of depreciation.

The firmness of apples decreased to most variants during refrigeration with values ranging between 3.38 Kgf/cm² (Jonatan) and 6.40 Kgf/cm² (Florina), while existing apples that retained their initial firmness almost unchanged, such as Idared variety, with a modified firmness of up to 1.82%.

Among all varieties, it was noted that Idared variety retained its initial firmness with an insignificant difference during storage (0.08%) and Golden delicious variety which had the lowest decrease in firmness.

The apple initial juice content is the highest over 600ml/kg, belonging to Idared and Florina varieties, and the lowest values were registered in Generos variety. During storage, the tendency was a slight increase in the juice content (on an average by 8.08% volumetrically and by 6.40% weight), compared to the initial values registered on storage.

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MANAGEMENT OF THE HYDROTECHNICAL TORRENT CONTROL STRUCTURES IN TEN TORRENTIAL VALLEYS LOCATED IN PRAHOVA COUNTY

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Abstract

The aim of this study was to assess the status of the hydrotechnical torrent control works located in ten managed torrential valleys from Prahova County. The works were visually assessed by using a simplified version of the methodology developed in 2014 by the staff of "Marin Drăcea" National Research-Development Institute in Forestry together with the staff from Faculty of Silviculture and Forest Engineering from Brașov. The damages and disfunctionalities were recorded separately for the transverse and longitude structures. The inventory was done between 6th of March and 16th of April 2016. In total, 144 hydrotechnical works were assessed (3 evacuation canals, 17 sills and 124 dams). The main identified damages consisted in detachments located in the overflowed area. Regarding the identified disfunctionalities, almost three quarters of inventoried works were affected by the clogging in various degrees (ranging generally between 50-70%), located both in spillway and apron. The high percentages of damages and disfunctionalities are due, most likely, to the lack or low number of interventions of maintenance and/or repair, especially for works carried out in the sixth and seventh decades of the last century. These findings should be regarded as a warning both for the local and national authorities, but also for the administrators of the forest fund.

Key words**:** *hydrotechnical structures, Prahova County, torrent control, torrential valleys*

INTRODUCTION

Hydrological and antierosional functions of the forests are very important in small predominately forested watersheds. Due to their high retention capacity, forests play a key role in preventing floods [2]. Properly managed, healthy, mixed, and ecologically stable forests provide the optimum hydrological function [14]. Recently, it has been reported that globally the frequency of extreme events has increased due to climate change, causing several damages to forests, flooding being among the ones with the highest impact [12].

In this context, the management of the hydrotechnical torrent control structures from the forested watersheds plays a key role and can lead to multiple effects in terms of hydrological, antierosional, economical and social plans [15].

One of the main functions of the torrent control structures is to reduce the intensity of erosion processes [8], especially in low forested watersheds. Also, the torrent control works are meant to avoid or reduce the damages that may be caused by torrential floods [19]. As an example, in Serbia, according to the records from the period 1915-2013, 848 torrential flood events were registered and 133 deaths caused by torrential events were recorded [13]. In Romania, the first studies regarding the management of torrential watersheds started in 1933, when "Marin Drăcea" National Research-Development Institute in Forestry was founded [10]. Like in Bulgaria, Macedonia, and Serbia, the time span between the fifth and the ninth decades of the last century was considered the "golden period" of erosion control in Romania [1], [11]. According to statistics, in the period 1950-2007, in Romania, more than 2,700 longitude hydrotechnical works and 14,600 transverse hydrotechnical structures were constructed [9]. These works are affected by continuing degradation mainly caused by the erosion, but also by the installation of forest vegetation, such as willows or alders, in the execution zone

of the constructions [4]. In this context, the monitoring of the torrent control structures provides useful information regarding their response to torrential floods and represents a key component in managing the resources required for their repairing [6].
The aim of this study was to assess the status of the hydrotechnical torrent control works located in ten managed torrential valleys from Prahova County.

MATERIALS AND METHODS

Ten torrential valleys from Prahova County were taken into consideration, namely Valea Florei, located closed to Posada village (N 45°16'41.6'', E 25°37'20.1''), Valea Conciului, located between Posada and Sinaia near national road no. 1 (N 45°17'27.2'', E 25°36'40.3''), Valea Orății, located near the town of Sinaia (N 45°17'42.7'', E 25°35'53.9''), Valea Dragă, located near Timișul de Jos train station (N 45°34'27,0'', E 25°36'49,1''), Valea lui Bogdan, located near Sinaia (N 45°18'27.7'', E 25°34'26.2''), Valea Doftanei, located very close to Paltinu Dam, Valea Urlătoarei, located near the neighborhood of Poiana Țapului (N 45°23'37.0'', E 25°32'05.5''), the valleys between Sinaia and Bușteni (the valleys located on the right bank of Prahova River), the valleys between Predeal and Timișul de Sus, the valleys between Măneciu and Cheia.
The works were visually assessed from downstream to upstream, by using a simplified version of the methodology developed in 2014 by the staff of "Marin Drăcea" National Research-Development Institute in Forestry together with the staff from Faculty of Silviculture and Forest Engineering from Brașov [17].
The damages and the disfunctionalities were recorded, separately for the transverse and longitude structures, respectively.
The inventory was done between 6th of March and 16th of April 2016.

RESULTS AND DISCUSSIONS

In total, more than 11 km of valleys were inventoried and 144 hydrotechnical works were assessed (3 evacuation canals, 17 sills and 124 dams). A larger number of dams, in comparison with other works, was also recorded for the Upper Tărlung Watershed, along the 21 torrential valleys [3].
Most of inventoried works were made of stone masonry with cement mortar, like in the case of torrent control structures within the Natura 2000 sites managed by RPLP Kronstadt and RPLP Săcele [18].
The main identified damages consisted in detachments located in the overflowed area (Figure 1), 58 works being in this situation.


Fig. 1. Dam with damages in the overflowed area

Moreover, approximately 15% of the inventoried structures had detachments also located on the left and on the right of the spillway (Figure 2).


Fig. 2. Damages located to the side of the spillway

The event of undermining of the body caused damages for 9% of the inventoried works (Figure 3). Undermining of the body was among the most common damages also in the case of Cârcinov River Catchment [16] or in the case of the Upper Basin of the Someșul Mic River [7].

Fig. 3. Undermining of the body of a work

Regarding the identified disfunctionalities, almost three quarters of inventoried works were affected by the clogging in various degrees (ranging generally between 50-70%), located both in spillway and apron (Figure 4).
About a third of the works were completely clogged in the spillway and about 15% in the apron.

Fig. 4. Dam with clogging in spillway and in apron

Moreover, the uncontrolled installation of forest vegetation was among the main disfunctionalities identified. The main species were represented by goat willow (*Salix caprea* L.), common aspen (*Populus tremula* L.), grey alder [*Alnus incana* (L.) Moench] and beech (*Fagus sylvatica* L.). Similar results were recorded also in the case of Cârcinov River Catchment, where 48 structures were affected by this event [13].
In our study, in 82 cases (57%), the vegetation was installed in the upstream of the work, and in 54 cases (38%) in the downstream of the work.
In 52 cases (36%) the forest vegetation was installed both in upstream and downstream of the structure (Figure 5).

Fig. 5. Uncontrolled forest vegetation installed both upstream and downstream of the structure

The high percentages of damages and disfunctionalities are due, most likely, to the lack or low number of interventions of maintenance and/or repair, especially for works carried out in the sixth and seventh decades of the last century. These deficiencies were also reported in the case of the torrent control structures within Natura 2000 sites managed by RPLP Kronstadt and RPLP Săcele [18].
Also, the poor funding in recent years could contribute as well to the lack of interventions.
These findings combined with the fact that in Romania's forest region more than 4.000 kilometers of hydrographic network are intensely torrentialised [5], should be a warning both for the local and national authorities, but also for the administrators of the forest fund.

CONCLUSIONS

Based on these results, we can say that in general, due to the recorded damages and disfunctionalities, the hydrotechnical works no longer efficiently fulfill the role for which they were constructed.

Even if generally the works made of concrete showed greater resistance over time, we still recommend the use of materials locally, namely the stone used in masonry, which, under proper maintenance, provides similar benefits like the structures made of concrete.

Taking into account the results of this study and corroborating them with the location of the most of the hydrotechnical torrent control works, we recommend that the repair work should been done with priority in the torrential valleys located upstream of important objectives such as national roads and localities of national interest.

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COMPARATIVE STUDY OF INLAND PRODUCTION AND CONSUMPTION OF POULTRY MEAT IN ROMANIA

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Abstract

This paper aimed to analyse the evolution of domestic production and consumption of chicken in Romania during the period 2006-2015. Romania's poultry meat supply was influenced by the value of inputs, reducing trend for the specific feed consumption, increasing the average daily gain, reducing mortality as a result of the implementation of good practices, and capitalization of production. This study covered the 2006-2015 period and was based on statistical data provided online by the Romanian Institute of Statistic and professional magazines. The production of poultry meat in Romania has been developed during the analyzed period and was influenced by the applied technology, as well as by impact of the subsidies which led to improvement of the production's performance. The results indicated by the regression method revealed the relationship between poultry meat production and the sales price of poultry meat in Romania, because the increase of the market price for poultry meat made this product more attractive to producers.

Key words**:** *poultry meat, regressions*, *Romania*

INTRODUCTION

Aviculture has an important role in livestock production, given that are obtained products with high nutritional value, widely used in the food industry, are suited to industrial, semi-industrial and extensive farming, and can harness a wide range of fodders.

Breeding of broilers provides farmers with welfare by generating profits and products of superior quality to consumers.

World poultry production has seen significant increases due to: progress in poultry farming, but also to increased product requirements caused by demographic increase and urbanization.

Romania's poultry meat supply is influenced by the value of inputs, reducing specific feed consumption, increasing the average daily increase, reducing mortality as a result of the implementation of good practices, and how to capitalize on production.

In our country the demand for poultry meat has increased significantly, taking advantage of the tendency of consumers to replace red meat with white meat, but also because of the lower price compared to beef or pork, which makes it accessible to all social categories.

Poultry consumption in Romania has experienced explosive growth similar to the upward trend in the world, being influenced by a number of objective and subjective factors, of which the most important are:

-Growth and urbanization of the population
-Absence of cultural or religious obstacles
-Income growth especially in developing countries
-Lower price compared to pork, beef or sheep
-Easier cooking and less pungent flavour
-Consumer tendency to substitute red and white meats for ease of fat removal.

Meat can be regarded as having a double image of the chemical composition, a positive and a negative image. The negative image is given by high fat content, the specialists making a link between meat consumption to heart disease, cancer and obesity. Also, experts believe that high protein and low carbohydrate content causes a low glycemic index that leads to obesity, diabetes and cancer. The positive image is given by the content in micronutrients available in meat such as iron, selenium,

vitamin A, B12 and folic acid because the bioavailability of these micronutrients in plant-derived foods is lower [7].

The controversial association between meat consumption and incidence of certain cancers needs clarification, although recent studies suggest that this is of utmost importance for processed red meat compared to the white meat [10].

The price level has always been one of the reasons that led to the purchase of food and will continue to have greater importance than the origin, brand, quality, or a combination thereof [2].

The most dynamic market in the meat sector will be the poultry because it is considered cheaper and healthier than others [5].

This paper aimed to analyse the evolution of domestic production and consumption of chicken in Romania during the period 2006-2015

MATERIALS AND METHODS

This study covered the 2006-2015 period and was based on statistical data provided online by the Romanian Institute of Statistic and professional magazines.

The research methods applied for the processing of the data necessary for the realization of this study were: method of index, regression and correlation.

The indicators analyzed in this study were: internal poultry meat production in Romania, consumption of poultry meat in Romania without self-consumption, poultry meat prices and total monthly average incomes.

The indices suggest the evolution of a phenomenon, pointing the annual growth rates. The correlation method highlights the degree of association between the variables.

In a narrow sense, it is a measure of the degree of statistical linkage between quantitative variables, called "coefficient of correlation "[3].

The determinant coefficient (r2) expresses how much of the variance of Y is due to factor X influence [1].

The regression method is a statistical method for the research of the link between the variables and can be considered as a method of generalization of the dispersal analysis.

The calculation of correlations and regressions was done using the statistical tool in Excel, useful in analyzing, simulating and interpreting the results.

RESULTS AND DISCUSSIONS

The production of poultry meat in Romania was sustained during the analyzed period was influenced by the applied technology, as well as by the subsidies for the improvement of the production's performance.

Poultry meat production registered an increase of 73.4% in 2015 compared to 2006. But one can see the decrease of production by 1% in 2011 compared to 2010 and in 2012 compared to 2011, in 2010 compared to 2009 there is a decrease of 5% (Fig.1).

Concerning the consumption of poultry meat without taking into account the self-consumption, it is noted the increase by 17.4% in 2017 compared to 2006. However, it can be seen a decrease of 19,9% in 2010 compared to 2009, in 2011 compared to 2010 the consumption of poultry meat drops by 6.4% and in 2013 compared to the year 2012 the decrease was 4.3%.

During the analyzed period, the sector faced a number of problems due to the economic crisis. This situation has affected the incomes of the population, which was reflected in the decrease in consumption.

The main advantages of poultry meat production compared to other types of meat are the relatively low cost and the obtaining of a high amount of meat in a low time.

It can be noticed that during the analyzed period, the average monthly total income had an upward trend during 2006-2009. In 2010 they decreased by 0.5% compared to 2010, this decrease was due to the economic crisis, which led to the decrease of salaries in the budgetary system. An upward trend followed until 2013, followed by a fall in 2014 (Fig.2).

Concerning the average price of poultry meat, an oscillating trend can be observed, the largest decrease being recorded in 2010 compared to 2009 by 11%.

Romanian poultry farming faced the economic crisis, with bankruptcies and insolvencies, but it also experienced a slight increase. It faced lower sales prices in the European Union, and implicitly with serious financial problems, but resisted, due to technical performance, improved year after year [5].

Next, the relationship between poultry meat production and the sales price of poultry meat in Romania will be pursued.

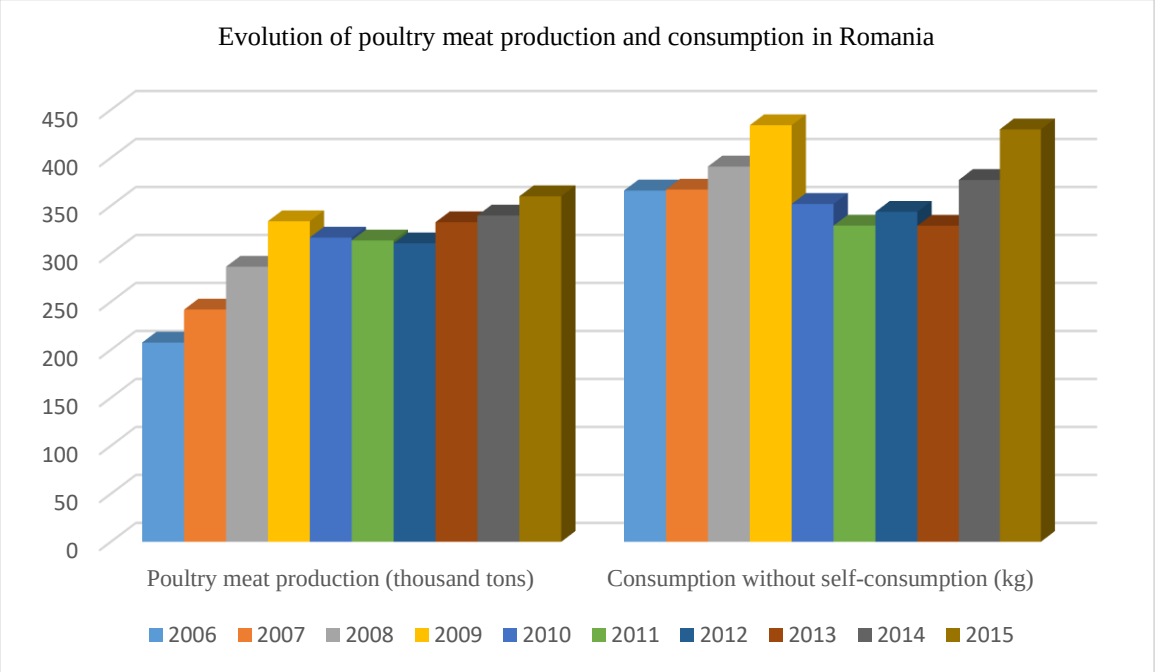

Fig.1 Evolution of production and consumption of poultry meat in Romania
Source: Avicultorul magazine [6][9], consumption without self-consumption during 2012-2015, are own estimates based on NIS Tempo on line data base

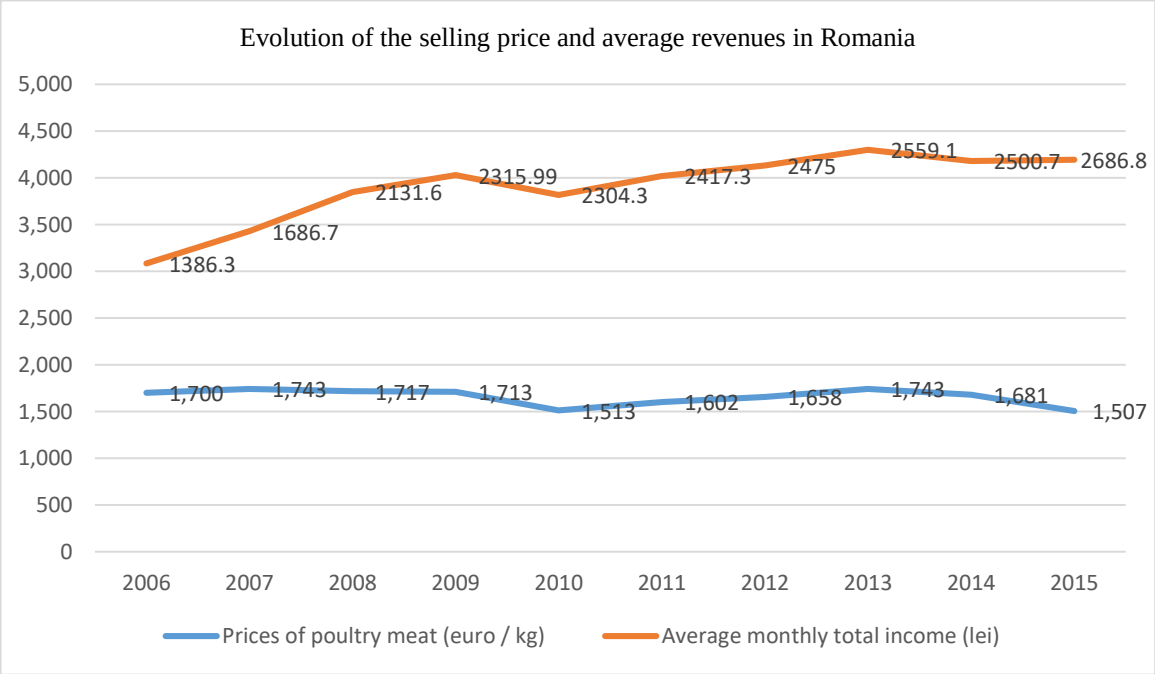

Fig.2 Evolution of the selling price and average revenues in Romania
Source: Avicultorul magazine [9], www.tempoonline.ro [4], the price of poultry meat in 2006 is estimated

Table 1. Results of the regression function between poultry meat production and the sales price of poultry meat

Regression Statistics	
Multiple R	0.661455
R Square	0.437522
Adjusted R Square	0.367213
Standard Error	421.123
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1103578	1103578	6.223	0.0373
Residual	8	1418757	177344.6		
Total	9	2522335			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	217.043	37.011	5.864	0.000	131.694	302.391	131.694	302.391
X Variable 1	0.059	0.024	2.495	0.037	0.004	0.113	0.004	0.113

Source: Own calculations

On the basis of the data from the table it is found that the link between poultry meat consumption and the selling price of poultry meat is of medium intensity, the correlation coefficient having a value of 0.661.

The value of the coefficient of determination, $R^2 = 0.437$, shows that 43.7% of the variation in poultry meat production is influenced by the variation in the selling price of poultry meat.

This link can be described by the linear regression model:

$$Y= 217.043+ 0.059\times \text{price}$$

This model is valid because the Snedecor-Fisher test value is 6.223 and the probability (F-statistic) is 0.0373, less than 0.05, the calculated value of the F test being higher than the theoretical.

The value of the parameter attached to the factorial variable is greater than zero, which means that there is a direct link between poultry meat production and the sales price of poultry meat.

So we can say that raising the price of poultry meat by 1 euro / kilogram leads to an increase in poultry meat production by 58 tons.

CONCLUSIONS

Improving the technologies used in poultry farming has led to an increase in domestic poultry meat production.

The increase in poultry meat consumption was influenced by objective and subjective factors, of which we can remember that the price of poultry meat is lower compared to beef or pig meat, which makes it accessible to all social categories.

The results indicated by the regression method revealed the relationship between poultry meat production and the sales price of poultry meat in Romania, because the increase of the market price for poultry meat made this product more attractive to producers.

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THE ANALYSIS OF LABOR PRODUCTIVITY IN A SPECIFIC ROMANIAN POULTRY BUSINESS DURING 2014-2016

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Abstract

In this paper it was attempted to analyze labor productivity in S.C Avicod S.A. It was chosen this medium sized enterprise, because in this case was recorded the biggest average daily gain. Labor productivity shows the efficiency of human resource use, reflecting the efficiency related with the amount of work involved in. Increasing labor productivity is the only effective way to raise salaries without generating inflation in a country's economy. This research is based on the indicators of the profit and loss account of S.C. Avicod S.A, obtained from open data sources offered online by the Ministry of Public Finance from Romania, for the period 2014-2016. The analysis methods used in data processing were: the comparison method, the indices method and chained factor substitution method. The three conditions of a profitable business, including under normal economic conditions, are: cheap inputs, good technical and economic results, and a better capitalization of production.

Key words**:** *labor productivity, poultry farming*

INTRODUCTION

Labor productivity shows the efficiency of human resource use, while reflecting the efficiency with which work has been spent.
Productivity is a key factor for any economy, as higher productivity is leading to increased real income, improved living standards and is generally believed to generate significant economic growth [5].
Increasing efficiency implies either more output is produced with the same amount of inputs or that fewer inputs are required to produce the same level of output [11]. The highest productivity is achieved when maximum output is obtained for a particular input level [6].
Increasing labor productivity is a strategic goal for any manager because it ensures profit growth, turnover and leads to lower production costs, so it is the condition of the economic development [12].
Increasing of labor productivity needs to take into account human resources because it is the only conscious factor able to put in practice modern technologies and to use methods of work organization [10].
The use of qualified workforce enables rational use of time and technical capacity for obtain high-quality goods [3].
Labor productivity is influenced some factors like: climatic conditions, technical progress, the level of organization of production, employee qualification, working conditions, legislation, motivation and satisfaction of the work done, and the climate at work.
Labor productivity is calculated by means of indicators in value or in physical expression.
Increasing labor productivity is the only effective way to raise salaries without generating inflation in a country's economy.
The farmers in the poultry farming are caught between high fodder prices, because there are no regulations on internal market of grain, and the relatively low purchase prices practiced by processing companies in the field.
Productivity in the poultry sector is influenced by the low cost for day-old chicks, labor force and amortization. The low cost for day-old chicks is due to good reproductive performance and incubation stations. The cost

of labor force in Romania is among the lowest in the European Union, and in terms of its amortization it made modernizations and refurbishments by obtaining European non-refundable or partially non-reimbursable funds.

An impediment to achieving high yields is represented by high energy costs, as the technology for broiler requires high energy consumption (aerotherms, fans, lamps).

In this paper we attempted to analyze labor productivity in S.C Avicod S.A. We chose this unit from the middle class, because here was the biggest average daily gain.

MATERIALS AND METHODS

This research is based on the indicators of the profit and loss account of S.C. Avicod S.A, obtained from www.mfinante.gov.ro, for the period 2014-2016. The analysis methods employed in data processing were: the comparison method, the indices method and chained factor substitution method.

Using the comparison method, events are analysis in time and space.

Considering that the indices present the evolution of a phenomenon schematically, but also emphasise the annual growth rhythms, we used them for technical and economic efficiency indicators

The method of chained substitution of factors is based on the successive variation and correlation of the factors specific to the analyzed phenomenon, the substitution assuming the substitution in a certain relationship of the value of a factor (from the previous period) with another value (actually achieved) [9].

Applying this method involves following principles:

-Substitution is made successively, starting with the quantitative factor and fallowing the qualitative factor

-An once-substituted factor is maintained at the substituted level to the end of analisys.

-Technical efficiency is the farmer's ability to obtain maximum product quantities using inputs to a minimum.[7]

The technical efficiency indicators analyzed are: the average daily gain, specific consumption and European Economic Index.

Daily average gain is an indicator of efficiency and represents the gain in weight obtained averaged over a feed day. The efficiency of this indicator is even higher as its value is higher. Increase the daily average gain can be achieved by using performance hybrids by improving growth and feeding conditions.

Specific feed consumption or feed conversion index is the amount of feed consumed to obtain one kilogram of weight gain. So it is a major source of preoccupation because of its role in the fodder cost, the lower its value, the better its performance.

The European Economic Index, the European Efficiency Factor or the Broiler Efficiency Index measure the technical performance. In Romania it was introduced in 1970 as a production index. The higher its value, the better is the technical performance.

Turnover is the volume of receipts at market price for a certain period of time, sums up all receipts and measures the economic performance of the unit. [1]

Profit is the absolute amount of profitability. Profiting is essential to doing business because it provides sources of investment and favors the introduction of technical and scientific progress.

RESULTS AND DISCUSSIONS

SC Avicod S.A. was founded in 2003 by the takeover of Codlea avia. The investments made led to increased production capacity and economic results.

SC Avicod S.A. owns four meat breeding farms located as follows:

- The Sfântu Gheorghe farm No.3 with a capacity of 1,800,000 broilers / year in the 18 fattening halls.
-The Ilieni farm No.7 with a capacity of 810,000 broilers / year in the 8 fattening halls.
-Codlea farm with a capacity of 1,800,000 broilers / year in the 24 growth halls.
-The Dumbravita farm No.7 with a capacity of 900,000 broilers / year in the 10 growth halls.

It owns five own showrooms, one of which is in Codlea and four are in Brasov. The evolution of technical efficiency indicators is important

for the unit as it can influence the economic performance of the unit.

According to Table 1, the daily average gain, increased by 2.2% in 2016 compared to 2015, which is a positive aspect contributing to the increase in live weight. Increasing this indicator can be achieved by respecting the microclimate, namely the temperature, the humidity and the ventilation.

The specific consumption indicator had a downward trend during the analyzed period, the positive influence of this indicator is given by the decrease of the consumption of fodder, respectively the decrease of the production cost. Decreasing feed consumption can be achieved by using scientifically established rations, using modern equipment to avoid waste, but also lowering density, thus avoiding competition for fodder.[3]

The European Economic Indicator increased by 3.5% in 2016 compared to 2015, a positive aspect as it is the most complex indicator taking into account: the viability of the effective, the mean weight at slaughter, the slaughter age and the specific consumption of the fodder.

Table 1. The technical efficiency indicators of S.C. Avicod S.A.

Indicators	U.M.	2014	2015	2016	2015/2014 (%)	2016/2015 (%)
Daily average gain	g/day	63.5	63.66	65.05	100.3	102.2
Specific consumption	Kg/kg of spor	1.69	1.64	1.62	97.0	98.8
EEI		366.3	378.2	391.3	103.2	103.5

Source: Avicultorul magazine (1) 2017[2], own calculations

Table 2. The evolution of the profit and loss account indicators at S.C. Avicod S.A.

Indicators	**M.U.**	**2014**	**2015**	**2016**	**2015/2014 (%)**	**2016/2015 (%)**
Turnover	lei	69,438,218	70,468,351	71,530,093	101.5	101.5
Profit	lei	1,580,476	4,794,031	4,523,744	303.3	94.4
Income	lei	96,931,563	119,056,399	123,085,107	122.8	103.4
Expenditure	lei	95,351,087	11,4262,368	118,561,363	119.8	103.8
Number of employees	number	197	292	314	148.2	107.5

Source: http://www.mfinante.gov.ro,[8] own calculation

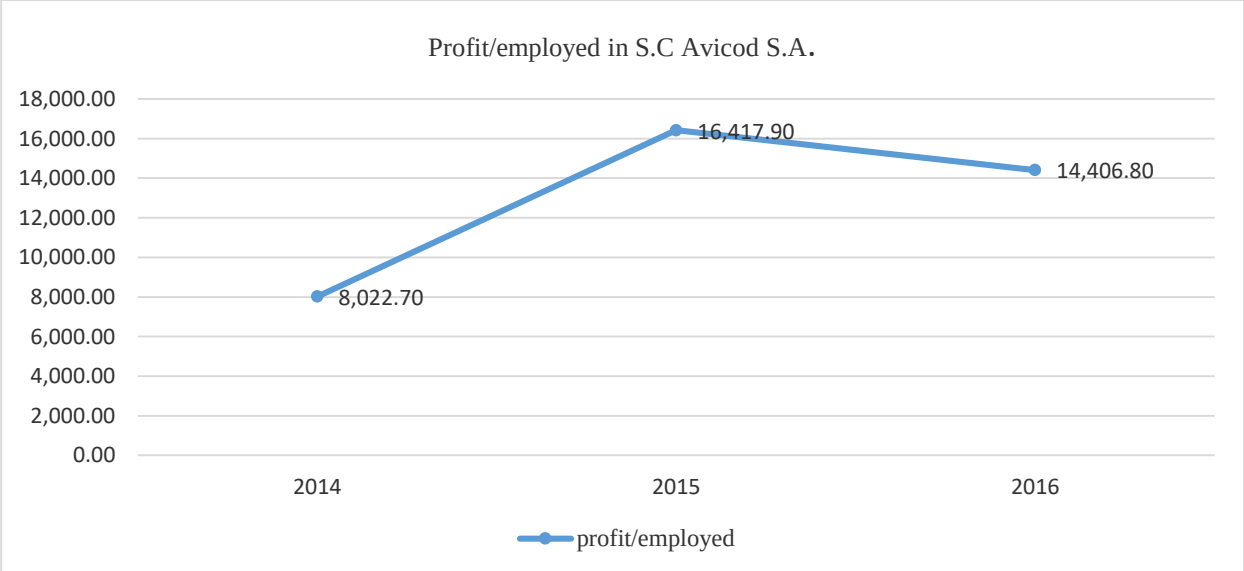

Fig.1. Profit/employee in S.C Avicod S.A. in the interval 2014-2016
Source: own calculation, based on http://www.mfinante.gov.ro [8]

According to the Table 2 the economic indicators in the analyzed period had an ascending trend, the highest increase it is observed to the profit, 202.3% in 2015

compared to 2014. In 2016 compared with 2015 profit decreased by 5.6%.

The evolution of profit / employee in S.C. Avicod S.A. in the period 2014-2016 is shown in Figure 1 and the growth of profit / employee can be observed. In 2015 the value of the profit/employee was the highest, but in 2016 it registered a slight decrease.

Table 3. The absolute and relative deviation of annual labor productivity;

Indicators	**2015/2014**		**2016/2015**	
	Absolute deviation (+/-)	**Relative deviation (%)**	**Absolute deviation (+/-)**	**Relative deviation (%)**
Profit/employee	8,395.2	2,04.6	-2,011.1	87.8

Source: own calculation, based on http://www.mfinante.gov.ro [8]

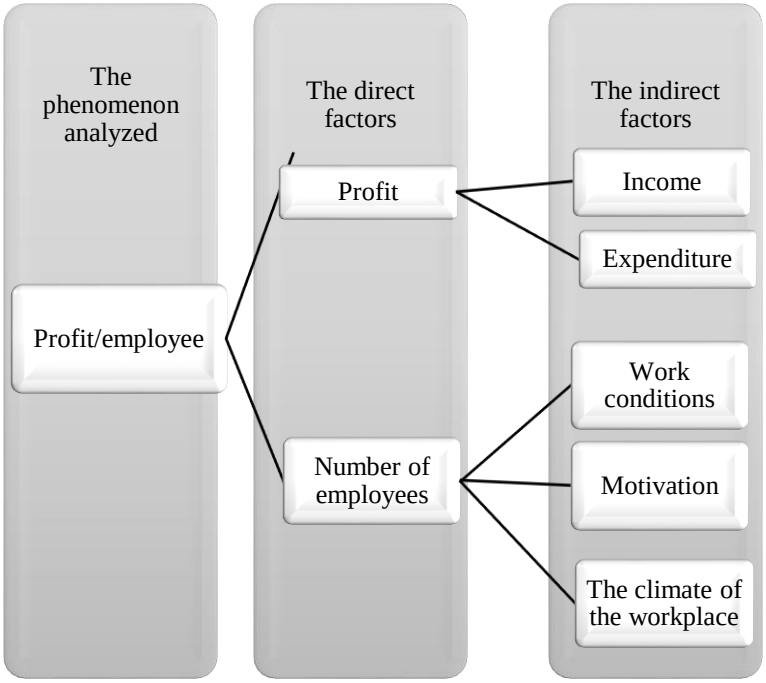

Fig.2 Direct and indirect factors of profit / employee
Source: own design and conception.

Table 4. Evolution of the influence of direct and indirect factors on profit / employee

Indicators	The factor type	2015/2014	2016/2015
Profit	**Direct**	**11,005.3**	**-860.8**
Number of employees	**Direct**	**-2,610.1**	**-1,150.3**
Income	Indirect I	22,124,836	4,028,708
Expenditure	Indirect I	-18,911,281	-4,298,995

Source: own calculation, based on http://www.mfinante.gov.ro [8]

Figure 2 shows direct and indirect first-degree factors for the profit / employee. Table 3 shows the evolution of profit / employee in S.C. Avicod S.A. in 2014-2016 period. Table 4 shows the influence of direct and indirect factors on the analyzed phenomenon. Their evolution taking into account Figure 2 and Tables 3 and 4 are presented below.

In 2015 compared to 2014 the profit/ employee increases by 8,395.2 lei / employee, respectively 104.6% (Table 3). At this growth the influences of the direct and indirect factors contribute, according to the Table 4.

The direct factor profit determines the increase of the economic efficiency of the labor force, respectively the increase of the profit/employee by 11,005.3 lei.

At this increase, the indirect factors of the first degree, the incomes have a favorable influence, causing it to increase by 22,124,836 lei, while the expenditures have a negative influence on the profit / employee, causing it to decrease by 18,911,281 lei.

The unfavorable influence of spending is due to higher prices for inputs needed for broiler.

The direct factor average number of employees has a negative influence on the profit / employee, causing it a decrease by 2,610.1 lei. The negative influence is due to an increase of the number of employees by 48% in 2015 compared to 2014.

In 2016 compared to 2015 the profit / employee decreases with 2,011.1 lei / employee, respectively 12.2% (Table 3).

To this fall the influences of the direct and indirect factors contribute, according to the Table 4.

The direct factor benefit determines the decrease of the profit / employee by 860.8 lei. At this decrease, the indirect factors of the first degree, the incomes have a favorable influence, causing the profit/employee increase by 4,028,708 lei, while the expenditures have a negative influence, causing the profit/employee decrease by 4,298,995 lei.

The direct factor number of employees has a negative impact on the profit / employee, causing it to decrease by 1,150.3 lei, due to the increase of the number of employees by 7.5%.

Indirect factors of the first degree, working conditions, motivation and the working climate are factors of a subjective nature, difficult to quantify, but which are reflected in the average productivity of labor.

CONCLUSIONS

Analyzing the labor productivity at S.C. Avicod S.A. with the help of the indicator the profit / employee it is noticed:

-The indirect first-tier factor the expenditure has the negative impact on profit / employee because the inputs are increase during the analyzed period.

-The technical efficiency indicators, respectively specific consumption and daily growth gains, improved over the period under review, contributing to lower spending and increased income.

-The number of employees had the negative impact on the profit / employee, due to the increase of the hired personnel. However, it can be seen that the value of the profit has increased.

The three conditions of a profitable business, including under normal economic conditions, are: cheap inputs, good technical and economic results, and a better capitalization of production.

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STUDY OF BIOLOGICALLY ACTIVE PARTICULARITIES OF PHEROMONE OF ANXIETY (THE SECRET) OF THE RED HYBRID WORM OF CALIFORNIA

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Abstract

The objective of the study consisted in determining some biologically active properties of the pheromone of anxiety(secret), obtained from the tissues of the Red Hybrid Worm of California for the purpose of its use in veterinary medicine. The object of the research served: the Red Hybrid worm of California, the pheromone of anxiety both natively and in various dilutions (from 1:1 to 1:100). During the study, the following methods were used: to obtain the pheromone of anxiety and sterilizing of it; the determination of bactericidal activity and lysozyme was performed by the photonefelometry method. As a result of the research it was found that the pheromone of anxiety manifested bactericidal activity towards microbial cultures Staphylococcus aureus (№ 209), Escherichia coli, Micrococcus luteus (Micrococcus lysodeikticus), Candida albicans depending on the used dilutions. In the undiluted native secret, the bactiricidal activity, tested by using these crops, constituted respectively 552.00%, 355.00% and 13,500.00%, and in the dilutions 1:1 - 1:100 it oscillated respectively from 250.00%, 370.00% and 3,900.00% till 23.00%, 42.00% and 100.0%. Towards the microbian culture Candida albicans microbial activity was not found. The lysozyme activity of the undiluted pheromone of anxiety constituted 10.20%, and in the dilutions 1:10 - 1:100 it oscillated from 8.60% to 8.70%, which led to the fact that research would no longer be continued. Thus, it was found that the pheromone of anxiety, obtained from tissues of Red Hybrid worm of California, has manifested a bactericidal activity depending on the concentration and type of microbial cultures on which the test was performed.

Key words: *bactercidal activity, lysozyme activity, anxiety pheromone, preparation, the Red Hybrid Worm of California*

INTRODUCTION

Since ancient times, worms have been a biological research object. The worms of the Red Hybrid of California (Eisenia foetida andrei) used as biotransformers of organic waste can also be used as proteinaceous additives in the foodration of poultry, pigs, fish and other animals. Also the biological mass of earthworms can be used in the pharmaceutical industry, medicine and other branches of the national economy.

The biological mass of worm contains essential quantities of ferments, vitamins, micro- and macro-elements and other biologically active substances [7]. From one tonne of organic waste, in the process of their bioconversion by the use of the technology of worm cultivation, is obtained 70-100 kg of biological mass of worms, in which are contained 67-72% of the protein, including amino acids: methionine, lysine, cystine and the others. Also, the biological mass of worms contains up to 12-17% of lipids, including phospholipids, saturated and unsaturated fatty acids.

According to the investigations it was found that on the surface of one hectare of the worm cultivator from the biological mass of earthworms, can be obtainedup to 40 tons of protein flour, which according to its protein content, not only does not yield, but to a certain extent exceeds meat flour, fish, soybeans and fodder yeasts. In nature, a more advantageous source is not known, which under industrial conditions would produce such a valuable protein for the livestock sector.

The characterization of food value of protein flour, obtained from the biological mass of worms, as compared to that of another origin, is exposed in the work of A.M. Igonin [9].

The biological mass of worms and products derived from it are widely used in the livestock sector in many countries: China, Japan, Kyrgyzstan, Ukraine, Russia, and so on. The amount of protein required for the body of the animals can be replaced by using the biological mass of worm's. Thus, in China and Japan, to broiler poultry were added to the food ration during the three weeks, 5-6 worms for each individual, and in India, in the diet of piglets daily, 25-30 of living worms. In Stavropol, adding 1.00% of live earthworms to the duck diet contributed to theincreaseof egg productivity with 25.00% [9].

The biological mass of worms in the form of flour can be used in feed of aquarium fish, reptiles, expensive fur animals and others [6].

During the last decades of the twentieth century, the biologically active substances of worm tissues, and especially the Red Hybrid of California, began to be used for the purpose of preparing the substances for use in veterinary and human medicine [8, 10].

In the works of B. M Anohin and others [2], [3], are exposed the preventive results of the use of extract obtained from the biomass of worms in the treatment of chemical burns. V.Abramov and others [1] evaluated the role of the biologically active peculiarities of preparations obtained from tissues of worm of the Red Hybrid of California on rabbit body resistance and immune stimulatory actions at salmonella of rabbits. In works L.Cremeneac and others [6], is mentioned the importance of the use of extracts obtained from worms tissues on immune, clinical and physiological status at young cattle.

The preparation obtained from the biological mass of worm of the Red Hybrid of California after sterilization was used for treat of wounds that were not prone to scarring, skin diseases and other aetiologies. This preparation also possesses immunomodulatory activity and antitumor action.

In order to obtain biologically active substances from tissues of worms Red Hybrid of California was elaborated the method to obtain of the preparation "Aflegmin", which has been tested for the treatment of skin burns and eye irritationcaused by chemical substances, conjunctivitis and irritation [4, 5].

Iu.Holodova and others [8] mentioned that the biological mass of earthworms can be used as: a protein complex with a content of 56% which contains a number of amino acids needed to increase the body mass of the animals; lipid complex with a content of 10% lipid complex, recommended as an active addition to cosmetic preparations and lipid-based amino acid concentrate - 10%, an aqueous solution used for the treatment of eye diseases.

Preventive positive results have also been obtained when using the preparation of earthworms in the treatment of such maladies: mastopathy, malignant tumors, psoriasis and osteochondrosis [8].

In the Scientific and Practical Institute of Biotechnologies in Animal Husbandry and Veterinary Medicine, has also been carried out research to obtain preparations from tissue of worms Red Hybrid of California and have been studied some particularities biologically active of them for the purpose of using medicinal remedies for veterinary medicine. One of the preparations was the pheromone of anxiety (the secret).

As a result of the research of the biologically active characteristics of the obtained preparation, it was found that it does not possess toxic and allergic activities, but it shows the bactericidal activity towards some microbial cultures.

MATERIALS AND METHODS

The research was carried out under the conditions of the laboratory "Ecological problems in zootechnics", within the Practical Institute of Biotechnologies in Animal Husbandry and Veterinary Medicine. All the works were performed in sterile conditions.

The research objects were: the worms the Red Hybrid of California, three fractions (concentrated, transparent, the precipitate kept in various periods) of the pheromone of the anxiety (the secret) obtained from the worm's tissues in native state as well as in various dilutions (1:1, 1:5, 1:10, 1:20, 1:50 and

1:100); Microbial cultures of Staphylococcus aureus, Escherichia coli, Micrococcus luteus (Micrococcus lisodeikticus), Candida albicans.

During the determination of the biologically active features of the pheromone of anxiety and its fractions, the following methods were used: for obtaining the pheromone of anxiety and its fractions, which included two steps: the first - the preparation of earthworms to impulse stimulation by electrocution and the second - the creation of sterile maximum conditions for obtaining the pheromone of anxiety and its fractions with the subsequent study of their biologically active features.

All works were done in sterile conditions. At the beginning of the research, the box where the works were carried out was disinfected using the bactericidal lamp.

Determination of bactericidal activity and lysozyme was performed by method of photocolorimetry using the KFK-2 photocolorimeter. As tests were used microbial cultures Staphylococcus aureus, Escherichia coli, Micrococcus luteus, Candida albicans.

Initially was obtained a one day culture of the microbial cultures mentioned above. Then in the test tube was placed 1.0 ml native secret or fractions of it were added 2.5 ml of the nutrient environment of agar of meat and peptone. To the same tube was added one drop of the day microbial culture for testing.

The contents of the test tube were divided into two equal parts by placing them in 2 sterile test tubes, so samples of the experimental variant were prepared. In the blank control test tubes were taken: 2.5 ml of the nutrient environment of meat and peptone and one drop of the microbial culture used for testing, in which the volume was also divided into two equal parts.

Subsequently, the content of a one test tube from an experimental variant and one of the control were calorimetric, using photocolorimeter KFK-2 with a green shake and the cuvette of 3.0 mm. Colorimetry was performed in comparison with distilled water. The other two experimental and control test tubes, with sterile media, were placed in the thermostat for 3 hours, then subjected to colorimetry just as the previous samples.The results of the colorimerization were used to calculate the difference between experimental and control samples. Calculations were performed according to formula (1), thus bactericidal activity (AB) was determined:

$$AB = 1- (\frac{A}{B} - \frac{a}{b}) \times 100\% \quad \textbf{(1),}$$ where

AB - bactericidal activity;

A - extension of the experimental sample, after 3 hours of storage in the thermostat;

B - extension of the control sample, after 3 hours of storage in the thermostat;

a - the initial extension of the experimental sample;

b - the initial extension of the control sample;

100 - transformation of the coefficient in%.

The activity of lysozyme was determined in the sterile anxious pheromone as Micrococcus luteus microbial culture was used as test. The lysozyme activity was determined by the photocolorimetric method.

The research was carried out on both in the pheromone of native anxiety and its dilutions 1:1; 1:5 1:10; 1:20; 1:50 and 1:100. Also, the biologically active features of the pheromone of anxiety were determined depending on the storage term.

RESULTS AND DISCUSSIONS

In order to obtain the pheromone of anxiety from the tissues of worm of California Red Hybrid,a device with two platinum electrodes, a glass of plastic and a power supply was fitted. In the process of controlling the working regimes of the mounted device, it was found that the most efficient one is the one in which the current drop is of 4.5 amps; duration of electrical stimulation - 30 seconds multiplicity - 3 times, stimulation interval - 30 seconds.The maximum amount of pheromone of anxiety, obtained from 50 mature worms, in the result of the triple electrical stimulation constituted 5.0 ml to 6.0 ml. Thus, the average amount of the pheromone of anxiety obtained from a mature worm in the above-mentioned stimulation regime consisted of 0.10 ml - 0.12 ml.

It was found that using ot her working regimes of the device used for electrostimulation, from a worm was obtained a smaller volume of pheromone of anxiety (0.04ml-0.06ml). For

research done for evaluation purposes of the biologically active features were obtained 350 ml of native sterile anxiety pheromone.

Therefore, the volume of the pheromone of anxiety obtained from the tissues of worms the Red Hybrid of California was found in dependence on the electrical stimulation regime.

Subsequently, using the Seitz filter, from the native pheromone of anxiety, the transparent liquid fraction and its solid precipitate were obtained. Both the pheromone samples of native anxiety and its fractions have been subjected to the study of biologically active features towards various microbial cultures.

The results of the investigations carried out on the determination of the bactericidal activity of the native anxiety pheromone and the fractions obtained from it (concentrated and in dilutions) depending on the microbial cultures Staphylococcus aureus, Escherichia coli, Micrococcus luteus, Candida albicans are shown in Table 1.

The analysis of the results of the researches regarding the bactericidal activity of the native pheromone of anxiety, concentrated, towards some microbial cultures found that it showed a higher activity than that of the dilutions used in the experiment. The bactericidal activity depending on Staphylococcus aureus of the dilutions 1:1, 1:5, 1:10, 1:20, 1:50 and 1:100 diminished respectively with 54.71%, 81.88%, 91.30%, 90.76%, 99.09% and 95.83%, in comparison with its value, manifested by the concentrated preparation towards this microbial culture.The highest bacterial activity towards Staphylococcus aureus manifested 1:1 dilutions (250.00%) and 1: 5 (100%), and the lowest dilutions were 1:50 - 5.00% and 1: 100 - 23.00%.

The bactericidal activity of the sample of the concentrated transparent fraction of the pheromone of anxiety depending to Staphylococcus aureus was also higher than in dilutions. Thus, analyzing the obtained results, it was found that the bactericidal activity of the dilutions 1: 1, 1: 5, 1:10, 1:20, 1:50 and 1: 100 obtained from the transparent pheromone fraction of anxiety towards Staphylococcus aureus diminished, respectively by 66.67%, 49.21%, 28.57%, 23.81%, 46.03% and 46.03%.

Table 1. Bactericidal activity of the pheromone of anxiety and its fractions depending on some microbial cultures.

The name of the sample	Bactericidal activity ,%		
	Staphylococcus aureus	Eschechia coli	Candida albicans
The native pheromone of anxiety			
1.Concentrated	552	370	-
2.Dilutions: a) 1:1	250	355	-
b) 1:5	100	70	-
c) 1:10	48	77	-
d) 1:20	51	93	-
e) 1:50	5	51	-
f) 1:100	23	42	-
The transparent fraction of the pheromone of anxiety			
1.Concentrated	63	43	400
2. Dilutions: a) 1:1	42	65	100
b) 1:5	31	49	100
c) 1:10	18	26	100
d) 1:20	15	36	100
e) 1:50	29	20	100
f) 1:100	29	8	-
The pheromone precipitation of anxiety			
1. Initial	986	124	-
2. Kept for a month	77	91	-
3. Kept for two months	69	53	-

Source: Own determinations

The lowest bactericidal activity was 1:20 dilution (only 15%).

The bactericidal activity of the solid precipitate fraction of the pheromone of anxiety was determined, depending on the period of storage in the refrigerator. It was found that the bactericidal activity of samples of the solid precipitate of the pheromone of anxiety depended on the storage period.

Thus, after one month of storage of the precipitate under refrigerator conditions, the bactericidal activity of Staphylococcus aureus decreased by 98.19%, and after two months it decreased by 93 %.

Hence, the precipitate obtained from the pheromone of anxiety must be used

immediately after it is obtained, because then its bactericidal activity towards Staphylococcus aureus is higher.

Bactericidal activity, depending on the microbial culture of Escherichia coli, also depended on the state of the pheromone of anxiety.

Thus, by testing the bactericidal activity of the pheromone of anxiety, native, concentrated and its transparent fraction, depending on the microbial culture of Escherichia coli, demonstrated that it was higher than in dilutions used in the study process.

The bactericidal activity of dilutions of native pheromone of anxiety 1:1, 1: 5, 1:10, 1:20, 1:50 and 1: 100, depending on the Escherichia coli microbial culture, decreased by 4.05% 81.08%, 79.19%, 86.22% and 88.65%, compared to the value of the pheromone of anxiety, native, concentrated.

The bactericidal activity of the concentrated transparent fraction of the anxiety pheromone, depending on the microbial culture of Escherichia coli, was higher than in the dilutions 1:10, 1:20, 1:50 and 1:100. The bactericidal activity of the mentioned dilutions decreased by 39.53%, 16.28%, 53.49% and 81.40%, respectively. The 1:1 and 1:2 dilutions of the transparent fraction of pheromone of the anxiety showed higher bactericidal activity towards the Escherichia coli microbial culture, surpassing that of the transparent concentrated fraction by 51.16% and 13.95%, respectively.

The bactericidal activity of the precipitate towards the microbial culture of Escherichia coli was high in the initial period, and after one month and two months of storage in the refrigerator, it decreased by 26.61% and 57.26%, respectively.

Both the native pheromone of anxiety, concentrated and its dilutions, and the precipitate obtained from it, did not show bactericidal activity towards the Candida albicans microbial culture. Against this culture, showed bactericidal activity, only the transparent fraction of the pheromone of anxiety and its dilutions. The bactericidal activity of all the dilutions (1:1, 1:5, 1:10, 1:20, 1:50, 1:100) of the transparent pheromone of anxiety, depending on the Candida albicans microbial culture, decreased by 75 % as compared to that of its concentrated fraction.

The results of the research on the bactericidal activity of the native pheromone of anxiety and the fractions obtained from it (concentrated and in dilutions) depending on Micrococcus luteus microbial culture are shown in Table 2.

Table 2. Bactericidal activity of the pheromone of anxiety and fractions obtained from it depending on Micrococcus luteus

Name of the sample	Bactericidal activity, %
Pheromone of anxiety native	
1.Concentrated	13,500
2. Diluțions: a) 1:1	3,900
b) 1:5	2,500
c) 1:10	1,500
d) 1:20	400
e) 1:50	200
f) 1:100	100
The transparent fraction of the pheromone of anxiety	
1.Concentrated	400
2. Diluțions: a) 1:1	-
b) 1:5	-
c) 1:10	40
d) 1:20	-
e) 1:50	-
f) 1:100	-
Precipitate of the pheromone of anxiety	
1. Initial	-
2. Kept for a month	-
3. Kept for two months	-

Source: Own determinations

In a result of the study of the bactericidal activity of the various fractions of the pheromone of anxiety towards microbial culture Micrococcus luteus it was found that it manifested it self differently depending on the fractions and dilutions. Analyzing the results outlined in Table 2, it was found that a high bactericidal activity was manifested by the pheromone of anxiety concentrated native, and fractions and dilutions had a lower activity. The bactericidal activity of the dilutions 1: 1, 1: 5, 1:10, 1:20, 1:50, 1:100 obtained from the pheromone of anxiety native towards the microbial culture Micrococcus luteus diminished respectively with 71.11%, 81.48%, 89.89%, 97.04%, 98.52% and 99.29%

compared to the same activity of the native pheromone concentrated.

The bactericidal activity, of the transparent fraction of the pheromone of anxiety depending on Micrococcus luteus microbial culture, diminished by 97.04% compared to that of native pheromone concentrated. Dilutions of this fractions did not show bactericidal activity against Micrococcus luteus, except for the 1:20 dilution, which had a lower activity with 90 % compared to the concentrated transparent fraction.

The pheromone precipitate of anxiety showed no bactericidal activity towards Micrococcus luteus microbial culture.

The lysozyme activity of the undiluted pheromone of anxiety constituted 10.2%, and in the dilutions 1:10 - 1:100 it oscillated from 8.6% to 8.7%, which led to the fact that research would no longer be continued.

CONCLUSIONS

Therefore, analyzing the results of the carried out researches, it was found that the high bactericidal activity was manifested by the pheromone of the anxiety, native concentrated towards the microbial Staphylococcus aureus and Escherichia coli, and towards Candida albicans this was absent.

The transparent fraction of the pheromone of anxiety concentrated manifested high bactericidal activity depending on Staphylococcus aureus, Escherichia coli and Candida albicans, and its dilutions 1:1 and 1: 5 - only towards Escherichia coli.

The obtained precipitate, from the pheromone of anxiety, showed high bactericidal activity only at the initial stage, as kept in refrigerator the bactericidal activity diminished depending on the storage period.

The lysozyme activity of the undiluted pheromone of anxiety and in 1:10 - 1:100 dilutions, depending on microbial culture Micrococcus luteus, manifested weakly, which led to the cessation of researches.

So, from the ones reported, the biologically active particularities of the pheromone of anxiety, depending on some microbial cultures, allow it to be used as an antibacterial preparation in the treatment of certain diseases.

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ECONOMETRIC ANALYSIS OF AGRICULTURAL LAND VALUES IN IMO STATE, NIGERIA (A HEDONIC PRICING APPROACH)

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Abstract

Overtime, land values have continued to diminish due to unsustainable land management practices engaged by the farmers. This study evaluated the econometric analysis of agricultural land values in Imo State, Nigeria. Multi-stage random sampling technique was used to select 75 farmers for the study. Information on the objectives of this study was elicited from the sampled respondents through a well structured questionnaire and interview schedule. Data were analyzed using descriptive statistical tools, and multiple regression models. The socio-economic features of the farmers reveal a mean age of 58 years, 12 years educational attainment, 5 persons per household, 15 years farming experience, and a mean farm size of 1.07. Results further showed that Owerri zone recorded the highest land values across the zones, the land values (Ha/farmer) from the zone was ₦278, 193.52 which is considerably higher than other land values obtained from Orlu and Okigwe zones respectively. Double-Log function was selected as the lead equation and was used to interpret the factors influencing land values across the three agricultural zones in the State. Hence efficient land management practices such as (organic manuring, crop rotation, alley cropping, etc.) were recommended for the farmers to improve land value in the area.

Key words**:** *econometric analysis, agricultural land values, hedonic model, Imo State, Nigeria*

INTRODUCTION

Land prices are differentiated on the basis of its production attributes in agriculture as well as other activities [3]. In rural areas, where agricultural production dominates economic activities, land is of higher use, hence attracts higher values.

However, the value of land is not influenced by its demand for constructions, building and urban development. Moreover, the potential returns from agricultural activities are capitalized into current farmland prices [6] with other variables reflecting the economic returns to agriculture. In some studies land values have been estimated through the influence of returns to agriculture [2].

In recent times, returns from lands have depreciated due to unsustainable land practices used by farmers' overtime. Farmers in a bid to maximize productivity and income use variant land practices which is concomitant to soil erosion, leaching, desertification, deterioration, thus threatening land productivity of the farmers. This is in line with [14] and [8].

Hedonic price models have been used extensively to impute the value of agricultural land based on its attributes in farmland prices [12] and [17].

Hedonic pricing suggests that prices of any heterogeneous commodity are determined by the quality characteristics of that commodity. The model has been used to estimate implied value of individual farmland based on the characteristics and multi-attributes of land as a factor of production [12].

This has made the price of land to be a component of bundle characteristics of some factors of production, and natural endowment. [3] classified agricultural characteristics as those that; influence farm income and profitability; external economies and governmental influence; expectations about

future conditions, buyer characteristics, seller characteristics and land characteristics.

The attributes of farmland prices are classified based on location of land, agricultural factors and non-agricultural factors [7] and [3]. Location reflects the proximity of the farmland vis-à-vis metropolitan area and developed area. Agricultural factors include characteristics related to the productivity of a specific parcel of farmland relative to others as well as attributes of the agricultural economy.

These could be drawn from arable crop production and returns from forest resources. Non- agricultural factors consist of economic characteristics of the region related to the potential demand to convert farmland to a non-agriculture [16].

The hedonic price approach is estimated using the ordinary least square of multiple regression analyses.

This is an econometric model that assesses the causal relationship between one variable and a group of other explanatory variables [1].

The agricultural variables are further split into two sub-groups. The first one is concerned with returns from agricultural production (monetary variables) like the price of output, market revenues, and government payments (like categories of government support such as input subsidy) amongst others.

There are also other non-monetary variables which have a clear influence on returns from land like yield, soil quality, market variables, and access to irrigation facility, etc. Furthermore, hedonic model captures only some internal and external land markets quantities which exclude urban pressure and some macro-economic factors like interest rate, inflation rate, property tax rate and unemployment rate amongst others [16].

The internal/agricultural variables are concerned with returns from agricultural production; government payments, etc. The external variables include variables describing the market, prices, and other related macro-economic factors.

MATERIALS AND METHODS

This study was carried out in Imo State, Nigeria. The State is located in the South-Eastern rainforest belt of Nigeria. Imo State has a total of 27 Local Government Areas which is divided into 3 Agricultural Zones namely; Owerri, Orlu and Okigwe.

Across these zones, agriculture is a major economic activity predominant amongst the people of the State. A multiple-stage random sampling technique was adopted in selecting the sample.

Three local government areas (LGAs), one from each of the agricultural zone, were selected using simple random sampling to get a representative sample of the State.

From each LGA, 3 communities were randomly selected. The list of arable crop farmers in each chosen community forms the sampling frame.

The list had farmers who cultivated on inherited or leased and rented farmlands from which 10 crop farmers were selected making a total of 90 farmers.

Out of these only 75 farmers were found useful for data analysis. Data collected using structured questionnaire and interview schedule were analyzed using descriptive statistical tools, and the hedonic model pricing approach.

The hedonic model pricing approach is anchored in consumer utility theory based on the assumption that price of a good (in our case land) can be explained by a set of characteristics (e.g. land quality, etc) affecting it. An estimable function of agricultural land price is a function of Z_i factors. i.e.

$$Li = \sum_{i=0}^{y} Zi + \mathcal{E}i \quad ----------Eqn.1$$

Where Z_i are variables representing characteristics that explained the quality of land and other factors affecting it. Z_i= 1 for all observation.

The model can be further expressed as follows:

$$Li = \beta o + \sum_{i=0}^{n} monetary\ returns\ from\ the\ land + \sum_{i=0}^{m} Non - monetary\ returns + \sum_{i=0}^{w} Macro - economic\ variables + \sum_{i=0}^{y} Government\ payments + \sum_{i=0}^{z} Market\ variables -- \quad Eqn.2$$

$$Li = \beta o + \sum_{i=0}^{n} \beta iXi + \sum_{i=0}^{m} XiYi + \sum_{i=0}^{y} YiVi + \sum_{i=0}^{z} ViN + \sum_{I=0}^{U} \lambda Qi -- \ Eqn.3$$

Where:
L_i = potential output or net income from land
X_i = monetary returns from the land
Y_i = non-monetary values or returns from the agricultural farm land
V_i= macro-economic variables
N= government payment
Q_i = market variables
The hedonic price approach is estimated using the ordinary least square multiple regression analyses.
Hence, the implicit form of the model is presented as follows;
P = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, e)
Where:
P = Farmland value or price (Naira)
X_1= Potential income from i^{th} class of land
X_2=Yield in the form of productivity (Naira)
X_3= Soil quality (using soil quality score)
X_4=Government payments (Dummy: if there is any form of government support such as input subsidy or loan from government or market for the product =1; and otherwise, 0)
X_5= Average farm size (hectares)
X_6 = Irrigation facility (Dummy: if the farmer has any form of irrigation facility on the land =1; and otherwise, 0)
X_7=Credit availability (Dummy; 1; if there is an institutional source of credit and 0, if otherwise)
e= error term
However, the Economic value of land = $E(P_L)$. This is expressed as:

$$E(P_L) = \beta_o + \beta_1\bar{X}_1 + \beta_2\bar{X}_2 + \beta_3\bar{X}3 + \beta_4X_4 \pm \beta_5X_5 \pm \beta_6X_6 \pm \beta_7X_7 \pm$$

These regression equation are then fitted into four functional forms as follows:

Linear $Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7$

Exponential $\ln Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7$

Double-log $Y = b_0 + b_1\ln x_1 + b_2\ln x_2 + b_3\ln x_3 + b_4\ln x_4 + b_5\ln x_5 + b_6\ln x_6 + b_7\ln x_7$

Semi-log $Y = b_0 + b_1\ln x_1 + b_2\ln x_2 + b_3\ln x_3 + b_4\ln x_4 + b_5\ln x_5 + b_6\ln x_6 + b_7\ln x_7$

RESULTS AND DISCUSSIONS

Socio-Economic Characteristics of the Respondents

The mean age of the respondents was 58 years. It implies that the farmers were beyond their active stage of life to produce the needed quantities of output. It is generally believed

that farmers output and productivity diminishes with advancing age. At this age farmers are growing weaker and as such loss of farming strength which declines maximum output. This finding agrees with [15] and contradicts [11] who reported that farmers at this age are more knowledgeable enough to scale through farm production constraints and have acquired enough farming experience to increase farm production in a short time.

The mean education level was 12 years and this implies that the farmers attended up to secondary school which qualifies them to take critical decision concerning their farming enterprises. This further implies that the farmers were better positioned to take advantage of new innovation techniques that could boost their farming. The result agrees with [10], assertion who stated that improved education level brings about positive changes in the knowledge, attitude and skills through research and extension. Educational attainment does not only raise agricultural productivity but also enhance farmer's ability to understand and evaluate information on new techniques. This supports the finding of [13]. The mean household size was 5.0 which fall within the range of 6-10. This is desirable and of great importance to rural household as they rely more on their family members than hired laborers in their farming, thereby reducing production cost. This finding is consistent with [15]. The mean farming experience was 15.4 years which implies that the farmers were relatively experienced to carry on with their production activities. According to [5] the years of farming experience of a farmer enables him to acquire practical and relevant farming knowledge which drive his ability to efficiently utilize available resources with discretion. The mean of the farm size was 1.07. This implies that farmers in the area operated small farm sizes which have an inverse relationship on productivity of the farm. This further implies that most of the farmers were operating on subsistence level.

This might not be unconnected with the difficulty in acquiring land for farming purposes. Studies have shown that most rural farmers in Nigeria operated on small scale basis [8].

Table 1. Socio-Economic Characteristics of the Respondents

Variable	Mean
Age (years)	58
Education (years)	12
Household size (No. of persons)	5
Farming experience (years)	15.4
Farm size (Ha)	1.07

Source: Field Survey, 2014

Estimation of Land Values across the three Agricultural Zones in Imo State

The Table 2 showed that Owerri zone recorded the highest land productivity of 2.76 than the productivity obtained from other agricultural zone. Orlu zone showed a land productivity of 1.96 while Okigwe zone had 1.84 respectively. The land productivity of 2.76 obtained in Owerri zone possibly led to the zone having higher returns of ₦76, 068, relative to Orlu and Okigwe zones that had values of ₦50,764 and ₦67,090 respectively. This implies that Owerri zone has favourable socio-economic factors that enhance the productivity of the farmers as well as their income. This agrees with the findings of [14]. The soil quality recorded in Owerri zone was higher in value in comparison with other zones. Owerri zone shows a value of 1.17 against Orlu and Okigwe zones with values of 0.93 and 1.12 respectively. This implies that Owerri zone had good soils which are very fertile for growth of arable crops. This is consistent with the findings of [4]. Orlu zone had the least farm size of 1.0 which is marginally lower than the value obtained in Okigwe zone while Owerri zone further recorded a higher farm size of 1.24. It is generally believed that larger farm size enhances land productivity of the farmers. This agrees with the findings of [15]. Again, the result showed evidence of government payments in terms of input subsidy across the various zones of the State. The irrigation facilities used in Okigwe zone was higher across the zones. This could be due to the nature of the soils found in the area. It could be further deduced from the Table that Orlu zone had the least volume of credit, ₦100,400 while

Okigwe and Owerri zones recorded an upward increase of ₦120,800 and ₦180,800 respectively. This implies that farmers in Owerri zone had more access to credit relative to other zones. The Table further showed that Owerri zone had higher land values than other zones, the land values (Ha/farmer) from the zone was ₦278,193.52 which is considerably higher than other land values obtained from Orlu zone and Okigwe zone respectively. This stems from the fact that variables such as productivity, soil quality, farm size, and volume of credit from the zone were higher across the zones and this might have resulted to higher land values recorded in Owerri zone. This agrees with the findings of [9].

Table 2. Land Value Estimates across the three Agricultural Zones in Imo State

Variables	Owerri zone (ha/farmer)	Orlu zone (ha/farmer)	Okigwe zone (ha/farmer)
Returns	76,068	50,764	67,090
Productivity	2.76	1.96	1.84
Soil quality	1.17	0.93	1.12
Farm size	1.24	1.0	1.1
Government payments	0.4	0.47	0.5
Irrigation facilities	21,320	29,200	74,400
Volume of credit	180,800	100,400	120,800
Land values	278,193.52	180,368.36	252,294.61

Source: Field survey, 2014

Factors Influencing Land Values Across the Three Agricultural Zones in Imo State

The four functional forms of the model were fitted in to establish the factors influencing land values across the three agricultural zones in Imo State. Double-Log function was selected as the lead equation based on having the highest number of significant variables, highest R^2 and F-statistics and was used to interpret the factors influencing land values across the three agricultural zones in the State. The model is expressed as:

Double-log: $Y = 3.303 + 0.742\ln x_1 + 0.029\ln x_2 - 0.169\ln x_3 + 0.000614\ln x_4 + 0.0059\ln x_5 - 0.008\ln x_6 + 0.0616\ln x_7$

The result showed that the co-efficient of multiple determination (R^2) was 0.834. This implies that about 83.4% variation of the endogenous variable was explained by the exogenous variables used in the model. The f-value which is highly significance at 1% reveals that all the included variables in the double-log model jointly account for the variation in land prices or the values.

The coefficient of returns was positive and significant at 1% level. This implies that any increase in returns in terms of higher output or yield from the land increases land values. This is consistent with the findings of [14].

Farm size showed a positive relationship with land values and was significant at 5% level. This implies that a unit percent increase in farm size will lead to a corresponding increase in land values. This agrees with the findings of [14] who stated that higher farm sizes are sine qua non for increase land values. Increase in farm size leads to adoption of improved soil management practices which enhance land values.

The coefficient of soil quality was negatively related to the land values and statistically significant at 10% level. This implies that an increase in soil quality by 1.00 units will give a less than proportionate decrease in land values by 0.169 units. This result is not consistent with the findings of [4]. The negative value could be as a result of farmers' use of unsustainable farming methods or practices like (bush burning, continuous cropping, etc) which poses an adverse effect on soil fertility, thus reducing land values of the farmers. The productivity of the farmers was positive and also significant 5% level which implies that any increase in productivity of the farmers will equally increase land values. According to [5] land value rises when the productivity of the land is on the increase.

The coefficient of credit availability showed a positive relationship with land value and was also significant 10% level. This further implies that a percent increase in credit availability of the farmers will lead to a corresponding increase in land values. Farm credit is a very necessary tool for increased output of the farmers. Credit enhances the acquisition of farm inputs and other logistics which induce higher productivity hence, higher land values. This is consistent with the findings of [14].

Table 3. Factors Influencing Land Values across the three Agricultural Zones in the State

EXPLANATORY VARIABLES	LINEAR FUNCTION	EXPONENTIAL FUNCTION	+DOUBLE-LOG FUNCTION	SEMI-LOG FUNCTION
Constant	46104.79	11.829	3.303	-20293
(t-stat)	(0.686)	(34.64)***	(10.993)***	(-12.720)***
Returns (x_1)	0.398	191E-06	0.742	19179
(t-stat)	(4.234)***	(9.489)***	(29.259)***	(14.253)***
Farm size (x_2)	-25398.4	-0.0815	0.029	66483
(t-stat)	(-4.157)***	(-0.761)	(2.611)**	(2.632)**
Soil quality (x_3)	49236.52	-0.1107	-0.169	-1811.86
(t-stat)	(0.918)	(-0.408)	(-1.801)*	(-0.028)
Productivity (x_4)	5262.89	-0.0193	0.00061	5903.16
(t-stat)	(2.936)***	(-0.656)	(2.023)**	(0.419)
Govt.ppt (x_5)	-15971.5	0.1914	0.059	-975.17
(t-stat)	(-0.769)	(1.849)*	(1.338)	(-0.041)
Irrigtn. (x_6)	38255.5	0.2578	-0.008	-22304
(t-stat)	(1.469)	(1.959)*	(-0.154)	(-0.731)
Credit (x_7)	-2515.1	0.0836	0.0616	-37873
(t-stat)	(-0.113)	(0.752)	(1.991)*	(-1.495)
R^2	0.813	0.636	0.834	0.7435
Adjusted R^2	0.794	0.598	0.817	0.7166
F-ratio	41.855***	16.729***	48.176***	27.729***
N	75	75	75	75

Source: Field survey, 2014.
+ = Lead Equation
***= 1% significance level
** = 5% significance level
* = 10% significance level

CONCLUSIONS

The findings of the study showed that farmers in the area operated on small scale basis which have an inverse relationship on the productivity and land values of the farmers. Results further showed that Owerri zone had higher land values across the zones. This stems from the fact that variables from the zone such as productivity, soil quality, farm size, and volume of credit were higher across the zones and this might have resulted to higher land values recorded in Owerri zone. Double-Log function was selected as the lead equation and was used to interpret the factors influencing land values across the three agricultural zones in the State. Hence efficient land management practices such as (organic manuring, crop rotation, alley cropping, etc.) were recommended for the farmers to improve land value in the area.

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IMPACT OF SUSTAINABLE SOIL MANAGEMENT TECHNIQUES ON POVERTY LEVELS OF ARABLE CROP FARMERS IN IMO STATE, NIGERIA

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Abstract

Efficient use of sustainable soil management techniques has proven to be a panacea for poverty reduction among farmers. Hence this study examined the Impact of sustainable soil management techniques on poverty levels of arable crop farmers in Imo State, Nigeria. Multi-stage sampling technique was used to select 209 arable crop farmers. Information on the objectives of this study was elicited from the sampled respondents through a well structured questionnaire. Data were analyzed using descriptive statistical tools, poverty index, average treatment effect (ATE) and local average treatment effect (LATE) models. Results showed that the mean per capita consumption expenditure among the farm households was ₦360.30 ($1.81) while the poverty line was ₦240.20 ($1.21) per person, per day. Over 70% of the respondents accounted for the number of poor in the area, while 21.5% accounted for the non-poor people. The result further showed that the use of sustainable soil management techniques reduced the poverty level of the farmers by 13.1 percent and 18.9 percent from WALD and IV estimators. Hence, appropriate government policies should be directed towards encouraging the rural farmers to embrace the use of improved farming techniques for increased output and poverty reduction.

Key words**:** *impact, sustainable soil, management techniques, poverty levels, crop farmers*

INTRODUCTION

Sustainable soil management technique is the application of soil management techniques that support plant growth without degrading the soil for further use [16]. It involves the application of soil management practices that sustain food crop production without posing any adverse effect either immediately or in future.

The relevance of sustainable soil management to agriculture includes the maintenance of soil productivity and economic viability over time without being depleted while maintaining and meeting the food demands of the present and future generations [14]. It is the adoption of land use and crop management strategies that enable soil users to maximize the economic and social benefits of the soil, enhance ecological support and maintain a balanced soil ecosystem [4]. Managing our soils sustainably is very crucial for agricultural production and ecosystems. Methods of protecting and enhancing the productivity of the soil include the use crop rotation, organic manure, minimum tillage, erosion control, avoiding traffic on wet soils and maintaining soil cover with plants and/or mulches [5].

This requires the combination of soil fertility treatment (perhaps including application of organic fertilizers) with soil and water conservation measures, implementation of agronomic principles, soil management and physical measures such as contour ridging, terracing, tied ridges or providing ground cover through mulching, use of leguminous plants and crop residues [6].

According to [11] poverty can be reduce through the application of sustainable soil management techniques which build up soils using products and by products from own property or a local source that is added directly to the soil for long term benefit. Poverty on its own, depicts lack of basic necessities of life [1] intensified by insecurity, deprivation of well-being assests and vulnerability to shocks

of climate change and food price fluctuations [26].

It is pervasive and manifests through social and pyschological deprivation from access to speech, decision making or accessement of cultural values, rights and freedom as well as the lack of dignity, self respect, security and justice [20] which engenders variant soil practices.

The poor adapts to shocks by using some copping strategies that are concomitant to soil degredation that reduced efforts of sustainable environmental management [2].

Hence the quick spread of land degredation. Poverty is often associated with low income [27] and low standard of living.

The incidence of poverty has plagued the rural farming households in Nigeria. Over 70% of the farmers cannot afford some modernfarming techniques [22].

Majority of the farmers still engage in the use of crude implements which is sine-qua-non to drudgery, low productivity and poor income. Consequently, poverty leads to low agricultural productivity and which further reinforced poverty incidence of the farmers. Most rural farmers in Imo State are resource-poor owing to the fact that they lack the ability to buy high yielding seeds, fertilizers, irrigation equipments and other tools needed to increase soil nutrients and land productivity [23].

[7] noted that apart from poverty incidence, the farmers' decision on the techniques of farming and tools to use especially in land preparation affect the bio-physical quality of the soil and the speed of soil depletion. Therefore, persistent use of some unsustainable soil management techniques by food crop farmers that dominate the crop production of the state could be the reason for the poor performance on food crop production, increased poverty and declining agricultural productivity in the State [9].

However, the extent to which the use of sustainable soil management techniques (SSMT) by arable crop farmers to reduce poverty especially in Imo State has not been documented, hence the need for this study.

MATERIALS AND METHODS

This research was conducted in Imo State of Nigeria, which is located in the South Eastern part of Nigeria with a land area of 5,530 sqkm. The State lies between latitudes $4^0 45^I$N and $7^0 15^I$N and Longitudes $6^0 50^I$E and $7^0 25^I$E. The State shares boundaries with Abia and Cross Rivers State to the East, Delta State to the West, Rivers State to the South and Enugu and Anambra State to the North [10]. The State has Owerri as its capital and made up of 27 (twenty-seven) Local Government Areas which are grouped into three agricultural zones namely Owerri, Orlu and Okigwe. Farming is the predominant occupation of the rural inhabitants. Multi-stage sampling technique was used for this study. In the first stage, two local government areas (LGAs) were purposively selected from each of the three agricultural zones of the State namely (Owerri, Okigwe and Orlu). The selection of these LGAs was based on their predominant agricultural activities and use of sustainable soil management techniques (SSMT). The LGAs selected were Ngor-Okpala and Ohaji-Egbema from Owerri zone, Nwangele and Isu from Orlu zone while Isi-ala Mbano and Obowo were selected from Okigwe zone respectively. A total of six (6) local government areas were used for this study. The second stage involved a random sample selection of arable crop farmers from the list of registered arable crop farmers using SSMT, kept with the zonal ADP's in each of the selected LGAs from the various zones of the State. Owerri zone has 122 registered arable crop farmers while Orlu and Okigwe zones have 130 and 109 arable crop farmers. This shows that there are unequal numbers of arable crop farmers across the three zones, hence an equal representation of sample was made from a proportion of 70 percent of the total population from each zone. This gave a sample size of 85 for Owerri zone, 91 for Orlu zone and 76 for Okigwe zone giving a total of 252 arable crop farmers across the six LGAs. However, the study eventually used only 209 valid questionnaires for analysis. Data were analyzed using descriptive statistical tools,

poverty index model, average treatment effect (ATE) and local average treatment effect (LATE) models following [8] and adapted by [24].

Poverty index model is stated as follows:

MPCE = $\frac{THCE}{HHSZ}\frac{THCE}{HHSZ}$ (1)

Where poverty line or threshold is the minimum level of income deemed necessary to achieve adequate standard of living in a given society [21]. This is shown as the mean per capita consumption expenditure (MPCE), which becomes a relative standard for poverty line usually measured as two-third of the MPCE of the household in the population under study. It is estimated using the total household consumption expenditure (THCE) which is an aggregate total expenditure on utility, service, food and durable assets of the household relative to the household size (HHSZ).

Average Treatment Effect models were specified thus:

ATE = $\frac{1}{n}\sum_{i=1}^{n} - \frac{(d_i - p(X_i)y_i}{p\,(X_i)(1-p(X_i)}$ **(**2) **ATE1** = $\frac{1}{n1}\sum_{i=1}^{n} - \frac{(d_i - p(X_i)y_i}{(1-p)(X_i)}$ ---------- (3)

ATE0 = $\frac{1}{1-n1}\sum_{i=1}^{n} - \frac{(d_i - p(X_i)y_i}{p(X_i)}$ --- ----------(4)

Where n is the sample size, $n_i = \sum_{i=1}^{n} d_i$ is the number of treated (i.e. number of SSMT users)

$P(X_i)$ represents the PSM evaluated at X_i

ATE = Average treatment effect

ATE0 = Average treatment effect on the untreated

ATE1 = Average treatment effect on the treated

Y_i = Outcome variable,

d_i = Use status of the farmers.

The LATE Model is further expressed as follows:

$$E(y_1 - \frac{y_0}{d_1} = 1) = LATE = \frac{cov(y,z)}{cov\,(d,z)} \quad (5)$$

$$= \frac{E\left(\frac{y}{z}=1\right) - E(\frac{y}{z}=0)}{E\left(\frac{d}{z}=1\right) - E(\frac{d}{z}=0)} \text{ ----} \quad (6)$$

$$= \frac{E(y_i * (z - E(z_i)}{E(d_i * (z - E(z_i)} \text{ ----} \quad (7)$$

The right hand side of eqn. (7) can be estimated by its sample analogue:

$$\left(\frac{\sum_{i=1}^{n} y_i z_i}{\sum_{i=1}^{n} z_i} - \frac{\sum_{i=1}^{n} y_i(1-z_i)}{\sum_{i=1}^{n}(1-z_i)}\right) \text{ X } \left(\frac{\sum_{i=1}^{n} d_i z_i}{\sum_{i=1}^{n} z_i} - \frac{\sum_{i=1}^{n} d_i(1-z_i)}{\sum_{i=1}^{n}(1-z_i)}\right) \quad (8)$$

Where:

Z = binary outcome variable

y_1 = high users of SSMT

y_0 = low users of SSMT

d_i = use status of the farmers

E = mathematical function

This is well known as the Wald and IV estimators, which can be estimated using two-stage least squares. The framework was designed by [17] and [15] in treating a set of heterogeneous population like the use of sustainable soil management techniques that has two possible outcomes denoted by y_1 and y_0 as high and low use of SSMT. High using status is denoted as d_1, otherwise d_0. The causal effect of use of SSMT on observed outcome is the difference between the two potential outcomes (y_1-y_0). But the realization is mutually exclusive for individual farmers, hence making it impossible to obtain the individual effect of using SSMT on the population. [8] noted that the impact parameter that identifies the causal effect of SSMT users in the presence of non-compliance as well as remove both overt and hidden biases is the local average treatment effect (LATE) which remedy the shortcomings associated with the computation of the average treatment effect.

RESULTS AND DISCUSSIONS

Estimated Poverty Line in Imo State

The estimated poverty line of the arable crop farmers is presented in Table 1. The Table depicts the estimated poverty line of the arable crop farmers which was based on per person, per day. Results showed that the mean per capita consumption expenditure among the farm households was ₦360.30 ($1.81) while the poverty line was ₦240.20 ($1.21) per person, per day. This implies that the farm households were living on ₦240.20 ($1.21) per person, per day. This differs from the findings from [19] and [11] which reported different poverty lines across arable farm households. This amount could be too low to meet the daily

needs of the entire farm household heads. Moreover, considering the poverty line obtained and the mean household size of 6 persons per household, these values ₦240.20 ($1.21) and ₦40.03 ($ 0.20) were lower than the international poverty threshold of ($1.25) per person, per day for people living in Sub-Saharan Africa and Asian countries as viewed by [25], [19] and [28]. The results tend to suggest problems of food insecurity among poor farm households. In other words these amounts may not be able to meet the minimum daily calorie in-take of 2,250 Kcal required per person per day. Hence, any household spending less than the amount obtained above on consumption is described as being poor while any other household spending exactly the stipulated amount or higher than that on consumption imply that the respondent is non-poor.

Table 1. Estimated Poverty Line

MPCE	**₦360.30 ($1.81)**
Poverty Line	₦240.20 ($1.21)
Mean Household Size (6 persons)	₦40.03 ($ 0.20)

Source: Computed from Field survey data, 2015
Note: The Dollars equivalents were given in parenthesis. The exchange rate was ₦199 per US Dollar in 2015.

Poverty Status of the Farmers with respect to Poverty Line

Table 2 shows that over 70% of the respondents accounted for the number of poor in the area, while 21.5% accounted for the number of the non-poor people in the study area implying that the percentage of the non-poor is too low compared to the percentage of poor people.

Table 2. Distribution of Farmers According to Poverty Status with Respect to Poverty Line

Poverty Status	**Frequency**	**Percentage**
Poor	164	78.5
Non-poor	45	21.5
Total	209	100

Source: Field Survey, 2015.

This further corroborates with the findings of [22] and [30] who reported that majority of the farmers in the State are resource poor which engenders the application of variant soil techniques.

According to the poverty line, anyone earning below ($1.21) per day is living in poverty and otherwise.

Impact of Sustainable Soil Management Techniques on Poverty Levels of Farmers

The impact of sustainable soil management techniques on poverty levels of arable crop farmers is shown in Table 3. Relative poverty line was used in this study to classify the respondent farmers as non-poor and otherwise poor. The proportion of poor or non-poor formed part of this estimate. This is different from [3] and [23] who adopted the per capita household consumption expenditure.

The propensity score matching and inverse propensity score weighing were -0.1235 and -0.0586 respectively. The estimates are negative and not significant even at $P \leq 0.1$ critical level. However, it could be deduced from the result that increase in the use of SSMT will reduce poverty by 12.35% and 5.86% respectively using these estimators. It is important to note that while overt bias were removed from the farmers self selection problems, the hidden bias still exist within the problem hence, making such estimators an inconclusive estimation procedure as far as impact studies is concerned. The intension to treat effect may not have been corrected using PSM and IPSW as non-compliance problems may persist. The use of SSMT is endogenous hence, the removal of non-compliance cannot be possible with PSM, because of its limitations as it does not account for hidden / decision bias and does not have causal interpretation on our outcome of interest [18] and Javier and [13]. However, the local average treatment effect was used in this study to curb the limitations of PSM and IPSW. Hence, the LATE estimator using WALD or IV becomes very efficient in elimination of the hidden bias from self selection problem. The WALD estimator while accommodating the oversights of PSM and IPSW has its estimate as -0.1313. While, the LATE estimator using IV has its value as -0.1894 as shown in Table 3 below. Hence, these estimates differs from the one obtained by [23]. The estimates are negative and significantly different from zero

at P≤0.01, hence, the inverse relationship of the sustainable soil management techniques with the poverty level of the farmers implies that the higher the use of sustainable soil management techniques, the lower the probability of the farmers being poor. The result further showed that the use of sustainable soil management techniques reduced the poverty level of the farmers by 13.1 percent and 18.9 percent from WALD and IV estimators respectively. Thus a unit increase in the use levels of sustainable soil management techniques would lead to a corresponding decrease in the poverty level of the farmers. This finding is consistent with *a priori* expectations and supports the findings from; [12], [15], [18], [23] and [29]. Furthermore, the finding also revealed that apart from the sustainable soil management techniques impact on farmer's net income, the use of SSMT also have significant impact on relative poverty levels of the farmers. Hence, the IV (Extension contacts) may have guided this finding. It therefore follows that the use of SSMT will not only increase farmer's net income; it can also reduce the poverty levels of arable crop farmers in the State.

Table 3. Impact of Sustainable Soil Management Techniques on Poverty Levels Arable Crop Farmers

	LATE Estimators			
PARAMETER	LATE (WALD)	LATE (IV)	ATE (IPSW)	PSM
ATE	-0.1313	-0.1894	-0.0586	-0.1235
	-(15.16)***	-(21.04)***	-(0.16)	
ATE 1			-0.0748	
			-(2.26)**	
ATE 0			-0.0419	
			-(0.35)	

Source: Computed from field survey data, 2015
***; ** indicates statistical significance at 1 percent, and 5 percent respectively

CONCLUSIONS

Poverty induces farmers to employ variant soil management techniques that are quite unsustainable and this approach has adversely affected the productivity and income of the farmers.

The findings of the study reveal a poverty line of ₦240.20 ($1.21) per person, per day using the relative poverty approach. This implies that the farm households were living on this income per person, per day. Thus, this amount suggests problems of food insecurity among poor farm households as evidenced in the poverty status. The Late model was used to remove both overt and hidden biases associated with the use of sustainable soil management techniques which helped in increasing the income of the farmers and thus, reducing their poverty levels in the area. Therefore; appropriate government policies should be directed towards encouraging the rural farmers to embrace the use of improved farming techniques for increased output and poverty reduction.

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DOMESTIC DAIRY PRODUCTS: DETERMINATION OF MARKET SHARE ON THE INTERNAL MARKET OF LITHUANIA

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Abstract

As alternative approach to the globalized and complex food system, the local or national food systems, which are expected to bring environmental, economic and social benefits, are often presented. This study aimed to present the methodology for the precise calculation of market shares of all and individual domestic dairy products on the internal market, to calculate the market shares of all domestic dairy products, drinking milk, butter and cheeses in Lithuania over the last years (from 2012 to 2016) and to analyse the underlying causes of market share changes. Between 2012 and 2016, the market share of all domestic dairy products in Lithuania decreased from 85% to 82%. The underlying cause of market share changes was linked to the differences in prices between domestic and imported dairy products.

Key words**:** *local food, domestic food, dairy products, domestic dairy products, market share, Lithuania.*

INTRODUCTION

The agriculture and food system has become increasingly globalized and complex. Over the past decades, international trade in agricultural and food products has increased considerably. That trade has shifted from agricultural raw materials and basic food staples to processed and branded food products [6; 21]. Income growth and intensive liberalization of trade, which took place in various economic regions, especially in Europe, have been the main causes of world trade growth in agricultural and food products [22].

The current food system is characterized by a process of distancing [3; 9; 23]. Consumers are disconnected from producers through three types of distance: spatial, temporal and psychological. Spatial distance indicates the physical disconnection of consumers and producers. Food products, produced and processed in one part of the world, are often consumed in other parts of the world. A lot of resources are needed to process and transport food products. Temporal distance increases time between production and consumption due to preservation and storage of food products. These first two types of distances create psychological distance – a distance of mind [11]. Consumers do not know where food comes from and how it produced and producers do not know who is buying the food they are producing [13].

The distance between food consumers and producers (both in miles and minds) is one of the main drivers of non-sustainability in the current food domain [17]. Local food systems represent alternative approach to the current food system, a system in which food travels long distances before reaches consumers. Locally produced food is often considered to be sustainable [10; 14; 24; 25].

A wide range of potential benefits are claimed to be derived when food is sold to consumers close to where it is produced. These benefits include environmental, economic, social, health aspects and in many ways are all related to the concept of sustainability [8; 12; 15; 16]. In environmental terms, benefits from local food systems may be delivered through reduced transport externalities (fossil fuel energy use, pollution, carbon dioxide emissions into the atmosphere), reduced specialization and intensification in agriculture, conservation of traditional agricultural landscapes, fostering of environmentally friendly production methods (organic production, protection of local biodiversity, reduced chemical inputs), reduced packaging and waste. The economic

benefits claimed for local production include increased the regional added value, creation of employment opportunities, better prices for consumers, greater incomes for farmers and food processors, reduced local dependencies on external market forces, economic spill-over, business skills development. There are many social benefits from local food systems, the most important of which are greater trust and connectedness between consumers and producers, maintenance and keeping agriculture in the region, conservation of traditional production techniques and consumption patterns (cultural identity), increased security of food supply, increased awareness about environmental and social effects of consumption, raised social justice locally and internationally. Finally, local food is expected to provide a number of health benefits. Local food systems increase availability of food that is healthier, more nutritious, better in taste and fresher (because of shorter distances that food travels) than food from non-local food systems [2; 8; 12; 16; 19].

There is no single definition of local food system or local food. Most of them use physical definitions. Local food can be defined in terms of geographical distance that food travels from food production to consumption. There is no agreement on this distance which may range from 30 to 400 miles [8; 12; 16; 18]. Local food can also be defined by political or administrative boundaries like a county, region, state or whole country [4; 8; 16; 20]. What all of these definitions have in common is a sense that local food is geographically determined and that proximity is important [1]. To sum up, it could be concluded that local food can be defined as food that is produced, processed, traded and consumed within a particular geographical area. In the absence of a uniform definition of local area, the consumers are the ones who decide whether food comes from a local area or not [7].

In recent years, in many countries, consumers have become significantly concerned about the food they consume and where it comes from and how it produced. There has been a growing interest among consumers in local food systems that combine environmental, economic and social factors. This trend provides an opportunity for countries, including Lithuania, to promote local food.

Lithuania, covering an area of 65,300 km², is a relatively small country. It is possible to drive the country in less than 4 hours. In terms of distance, the consumption of Lithuanian food products is relatively close to the production site. Therefore, domestic food products could be regarded as local. Besides, the results of the survey recently carried out in Lithuania show that the majority of Lithuanian consumers perceive local food as food produced within more than 100 km from their homes. The interviewed persons also strongly agree with the definition of local food as food produced in Lithuania. As most of consumers consider Lithuanian made food as local, the term local food may be understood similarly to domestic food [5].

There are a large number of different food products that are produced in Lithuania. The Lithuanian agricultural sector is diverse. It covers a wide range of livestock and plant cultivation sub-sectors. The major parts in the structure of total agricultural production belong to grain and milk (in 2015, with a percentage of 39.7% and 17.2%, respectively). The dairy sector historically and traditionally has been, and remains, one of the most important agricultural activities in Lithuania. Favourable natural conditions, stocks of feedstuffs, traditions and experience in dairy production have laid down a solid foundation for the development of dairying.

The dairy processing industry is one of the modern sectors of the food industry in Lithuania and is capable of supplying 100% of the Lithuanian demand. This industry exports almost half of its production. The production capacity of Lithuanian dairy processing enterprises is larger than the supply of raw milk from domestic milk producers, and therefore about 20% of raw milk is imported.

A variety of dairy products are produced for domestic and export markets and these include fresh dairy products, cheeses, butter, condensed milk and other products. At the European Union level, *Lietuviškas varškės sūris* (unripened curd cheese) and *Liliputas*

(handmade, high-fat (50% in dry matter), semi-hard cheese) are recognized under the label of Protected Geographical Indication and *Žemaitiškas kastinys* (dairy product from sour cream) under the label of Traditional Speciality Guaranteed.

Milk and dairy products are among the products that form the basis of the Lithuanian diet. There are some traditional dairy products, such as sour cream, cottage cheese, sweet curd cheese, fried cottage cheese, dried curd cheese, curdled milk, which are appreciated and liked by consumers.

The majority of dairy products, sold on the internal market, are produced in Lithuania, but the availability of foreign-made dairy products is increasing in recent years. Lithuanian consumers can choose between domestic and imported dairy products, therefore it is of particular interest to determine the market share of domestic dairy products on the internal market and to examine market share changes over time.

MATERIALS AND METHODS

This study aimed to present the methodology for the precise calculation of market shares of all and individual domestic dairy products on the internal market, to calculate the market shares of all domestic dairy products, drinking milk, butter and cheeses in Lithuania over the last years (from 2012 to 2016) and to analyse the underlying causes of market share changes.

The methodology for the calculation of market shares of all and individual domestic dairy products on the internal market over a certain period is created, taking into account the accessibility of statistical data and the specifics of the presentation of statistical data. For this reason, own-produced and consumed dairy products as well as dairy products, sold directly by the milk producers to the final consumers, are excluded from the calculations. All calculations are based on data from the Lithuanian Department of Statistics (Statistics Lithuania).

For the purposes of the calculation of market share for all domestic dairy products on the internal market, the statistical data in value terms are used, as only in this way, the data are comparable. In order to calculate the value of domestic and imported dairy products, wholesale prices are used as the statistical data to calculate the value in retail prices are not available. For the purposes of the calculation of market shares for individual domestic dairy products on the internal market, the statistical data in volume terms are used. The calculations in volume terms are more precise since in these cases the error due to effects of prices is avoided (usually prices of dairy products fluctuate over a very wide range).

The market share of all domestic dairy products on the internal market is calculated according to the formula:

$$MS_{\text{domestic dairy prod.}} = \left(\frac{V_{\text{domestic dairy prod.}}}{V_{\text{dairy prod.}}}\right) \text{x } 100;$$

In this formula:

$MS_{\text{domestic dairy prod.}}$ – market share of all domestic dairy products on the internal market, %;

$V_{\text{domestic dairy prod.}}$ – total value of all domestic dairy products, sold on the internal market, EUR;

$V_{\text{dairy prod.}}$ – total value of all dairy products, sold on the internal market, EUR.

The total value of all dairy products, sold on the internal market, is calculated according to the formula:

$$V_{\text{dairy prod.}} = V_{\text{domestic dairy prod.}} + IV_{\text{dairy prod.}} - IV_{\text{raw milk}} - (REV_{\text{dairy prod.}} - REV_{\text{raw milk}});$$

In this formula:

$IV_{\text{dairy prod.}}$ – total import value of all dairy products, EUR;

$IV_{\text{raw milk}}$ – total import value of milk and cream, not concentrated nor containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 3% but not exceeding 6%, in immediate packings of a net content exceeding 2 litres, EUR;

$REV_{\text{dairy prod.}}$ – total re-export value of all dairy products, EUR;

$REV_{\text{raw milk}}$ – total re-export value of milk and cream, not concentrated nor containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 3% but not

exceeding 6%, in immediate packings of a net content exceeding 2 litres, EUR.

The total import value of milk and cream, not concentrated nor containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 3% but not exceeding 6%, in immediate packings of a net content exceeding 2 litres, hereinafter referred to as raw milk, is deducted from the total import value of all dairy products since this milk includes raw milk. Raw milk is not yet a dairy product, it is a raw material for the production of dairy products and enters the dairy processing enterprises for further processing and should not therefore be included in the dairy market.

For the purposes of the calculation of market shares for individual domestic dairy products on the internal market, the methodology is different for milk and cream, that include raw milk, and for other dairy products.

The market share of domestic milk and cream, that include raw milk, on the internal market is calculated according to the formula:

$$MS_{\text{dom. milk and cream } i} = \left(\frac{Q_{\text{dom. milk and cream } i}}{Q_{\text{milk and cream } i}}\right) \text{ x } 100;$$

In this formula:

$MS_{\text{milk and cream } i}$ – market share of domestic milk and cream *i* on the internal market, %;

$Q_{\text{dom. milk and cream } i}$ – total volume of domestic milk and cream *i*, sold on the internal market, tonnes;

$Q_{\text{milk and cream } i}$ – total volume of milk and cream *i*, sold on the internal market, tonnes.

Total volume of milk and cream *i*, sold on the internal market, is calculated according to the formula:

$$Q_{\text{milk and cream } i} = Q_{\text{dom. milk and cream } i} + \\ + IQ_{\text{milk and cream } i} - IQ_{\text{raw milk}} - \\ - (REQ_{\text{milk and cream } i} - REQ_{\text{raw milk}});$$

In this formula:

$IQ_{\text{milk and cream } i}$ – total import volume of milk and cream *i*, tonnes;

$IQ_{\text{raw milk}}$ – total import volume of raw milk, tonnes;

$REQ_{\text{milk and cream } i}$ – total re-export volume of milk and cream *i*, tonnes;

$REQ_{\text{raw milk}}$ – total re-export volume of raw milk, tonnes.

The market share of other domestic dairy products on the internal market is calculated according to the formula:

$$MS_{\text{domestic dairy prod. } i} = \left(\frac{Q_{\text{domestic dairy prod. } i}}{Q_{\text{dairy prod. } i}}\right) \text{ x } 100;$$

In this formula:

$MS_{\text{domestic dairy prod. } i}$ – market share of domestic dairy product *i* on the internal market, %;

$Q_{\text{domestic dairy prod. } i}$ – total volume of domestic dairy product *i*, sold on the internal market, tonnes;

$Q_{\text{dairy prod. } i}$ – total volume of dairy product *i*, sold on the internal market, tonnes.

Total volume of dairy product *i*, sold on the internal market, is calculated according to the formula:

$$Q_{\text{dairy prod. } i} = Q_{\text{domestic dairy prod. } i} + IQ_{\text{dairy prod. } i} - \\ - REQ_{\text{dairy prod. } i};$$

In this formula:

$IQ_{\text{dairy prod. } i}$ – total import volume of dairy product *i*, tonnes;

$REQ_{\text{dairy prod. } i,}$ – total re-export volume of dairy product *i*, tonnes.

RESULTS AND DISCUSSIONS

The market share of all domestic dairy products in Lithuania from 2012 to 2016 is shown in Table 1.

Table 1. The market share of all domestic dairy products in Lithuania from 2012 to 2016

	2012	**2013**	**2014**	**2015**	**2016**
Value of all domestic dairy products, sold in Lithuania, mill. EUR	376.8	356.7	360.2	355.1	391.3
Import value of all dairy products, minus re-export value of all dairy products and import value of raw milk, mill. EUR	66.2	88.6	107.2	94.9	84.2
Market share of all domestic dairy products in Lithuania, %	**85**	**80**	**77**	**79**	**82**

Source: Own calculation.

In 2012, all domestic dairy products held a share of 85% of the total value of all dairy products supplied in Lithuania. This market share decreased to 80% in 2013 and to 77% in 2014, but increased to 79% in 2015 and to 82% in 2016.

In 2013, as compared to 2012, the total value of all domestic dairy products, sold in Lithuania, declined by 5.3%, while the total import value of all dairy products, including the total import value of ice cream, lactose, casein, but excluding the total import value of raw milk and the total re-export value of all dairy products, rose by 33.8%. When the total value of all domestic dairy products, sold in Lithuania, decreased and the net import value of all dairy products increased significantly, the market share of all domestic dairy products in Lithuania fell by 5 percentage points to 80% in 2013. In 2014, as compared to 2013, the total value of all domestic dairy products, sold in Lithuania, grew by 1.0%, but the net import value of all dairy products rose by 21.0%, therefore the market share of all domestic dairy products in Lithuania dropped by 3 percentage points to 77%. Between 2015 and 2016, the net import value of all dairy products decreased slightly more than by 11% per year, while the total value of all domestic dairy products, sold in Lithuania, decreased by 1.4% in 2015 but increased by 10.2% in 2016. Consequently, the market share of all domestic dairy products in Lithuania rose by 2 percentage points to 79% in 2015 and by 3 percentage points to 82% in 2016.

Table 2. The market share of domestic drinking milk in Lithuania from 2012 to 2016

	2012	**2013**	**2014**	**2015**	**2016**
Volume of domestic drinking milk, sold in Lithuania, thou. t	94.7	92.9	93.7	96.5	94.5
Import volume of drinking milk, minus re-export volume of drinking milk and import volume of raw milk, thou. t	10.6	20.1	17.5	18.8	23.6
Market share of domestic drinking milk in Lithuania, %	**90**	**82**	**84**	**84**	**80**

Source: Own calculation.

Between 2012 and 2014, market share changes of domestic drinking milk in Lithuania resulted from development of the import volume of drinking milk, minus the re-export volume of drinking milk and the import volume of raw milk. The net import volume of drinking milk rose by 89.6% in 2013, fell by 12.9% in 2014, but grew by 7.4% in 2015 and by 25.5% in 2016. The total volume of domestic drinking milk, sold in Lithuania, decreased and increased within the 1–2% limit over the period under consideration with the exception of 2015, when this volume rose by 3.0%.

The market share of domestic butter in Lithuania from 2012 to 2016 is shown in Table 3. In 2012, domestic butter held a share of 83% of the total volume of butter supplied in Lithuania. This market share decreased to 80% in 2013 and to 74% in 2014, increased to 77% in 2015 and remained stable in 2016.

Between 2012 and 2014, the market share of domestic butter in Lithuania dropped due to the weakened positions of Lithuanian dairy processors and higher import volume of butter. In 2015, as compared to 2014, the increase in market share of domestic butter in Lithuania was a result of increased sales volume of Lithuanian dairy processors. In 2016, as compared to 2015, the total volume of domestic butter, sold in Lithuania, rose at the same pace as the total import volume of butter, therefore the market share of domestic butter in Lithuania remained stable.

The market share of domestic drinking milk in Lithuania from 2012 to 2016 is shown in Table 2. In 2012, domestic drinking milk held a share of 90% of the total volume of drinking milk supplied in Lithuania. This market share decreased to 82% in 2013, increased to 84% in 2014, remained stable in 2015 and decreased to 80% in 2016.

The market share of domestic cheeses in Lithuania is shown in Table 4. In 2012, domestic cheeses held a share of 87% of the total volume of cheeses supplied in Lithuania. This market share decreased to 81% in 2013, increased to 82% in 2014, remained stable in 2015 and increased to 83% in 2016.

Table 3. The market share of domestic butter in Lithuania from 2012 to 2016

	2012	2013	2014	2015	2016
Volume of domestic butter, sold in Lithuania, thou. t	74.3	64.5	65.2	74.6	88.6
Import volume of butter, minus re-export volume of butter, thou. t	1.5	1.6	2.3	2.2	2.6
Market share of domestic butter in Lithuania, %	**83**	**80**	**74**	**77**	**77**

Source: Own calculation.

Table 4. The market share of domestic cheeses in Lithuania from 2012 to 2016

	2012	2013	2014	2015	2016
Volume of domestic cheeses, sold in Lithuania, thou. t	43.7	42.3	41.7	43.5	46.4
Import volume of cheeses, minus re-export volume of cheeses, thou. t	6.8	10.1	9.0	9.7	9.6
Market share of domestic cheeses in Lithuania, %	**87**	**81**	**82**	**82**	**83**

Source: Own calculation.

Between 2012 and 2015, the total volume of domestic cheeses, sold in Lithuania, developed more steadily, and only in 2016, as compared to 2015, this volume rose by 6.7%. The net import volume of cheeses increased by 48.5% in 2013, decreased by 10.9% in 2014, rose by 7.8% in 2015 and fell by 1.0% in 2016. Taking into account these developments, the market share of domestic cheeses in Lithuania fluctuated over the period under consideration. As regards the period 2012–2016, the market share of all domestic dairy products in Lithuania had been on a downward trend, despite the fact that this share increased between 2015 and 2016 but did not reach the level of 2012. Those changes were caused by the differences in prices between domestic and imported dairy products. Although some foreign-made dairy products were imported into Lithuania to supplement the range of domestic dairy products, however a significant part of foreign-made dairy products were imported due to lower prices, especially since 2013, when the prices of dairy products, sold by Lithuanian dairy processors on the internal market, increased a lot during the year (in December 2013, as compared to the same month in 2012, these prices rose by 13.8%).

The price comparison between the domestic price and the import price of butter is shown in Table 5. The average wholesale price of butter, sold by Lithuanian dairy processors on the internal market, was higher than the average import price of butter each year over the period 2012–2015 (by 6.3% in 2012, by 8.5% in 2013, by 3.2% in 2014, by 8.5% in 2015), and only in 2016, the price of domestic butter was lower than the price of imported butter (by 1.5%).

Table 5. The average prices of butter, sold in Lithuania, from 2012 to 2016

	2012	2013	2014	2015	2016
Average wholesale price of Lithuanian dairy processors, EUR/kg	3.70	4.23	3.90	3.56	3.32
Average import price, EUR/kg	3.48	3.90	3.78	3.28	3.37

Source: Statistics Lithuania.

The price comparison between the domestic prices and import prices of certain cheeses is shown in Table 6. In 2012, the prices of most imported cheeses were higher than the wholesale prices of cheeses, sold by Lithuanian dairy processors on the internal market, indicating that foreign-made cheeses were imported into Lithuania to supplement the range of domestic cheeses. The situation changed in 2013, when the prices of domestic cheeses, except the prices of blue-veined cheeses, were higher than the prices of imported cheeses, indicating that foreign-made cheeses were imported into Lithuania due to lower prices. Only in 2016, the average price of imported fermented cheeses was higher than the average price of domestic fermented cheeses.

As prices of dairy products on the world market fell, Lithuanian dairy processors undercut prices as well, but they did not regain the market share they had lost.

Table 6. The average prices of certain cheeses, sold in Lithuania, from 2012 to 2016

	Fresh cheeses, curd	Grated cheeses	Processed cheeses	Blue-veined cheeses	Fermented cheeses
Average wholesale price of Lithuanian dairy processors, EUR/kg					
2012	2.89	8.14	3.34	4.73	3.68
2013	2.99	7.93	3.57	5.16	4.28
2014	3.14	7.93	3.63	5.28	3.14
2015	2.94	7.60	3.39	5.39	3.69
2016	2.88	7.61	3.34	5.23	3.48
Average import price, EUR/kg					
2012	2.54	4.09	3.45	6.22	3.91
2013	2.59	4.47	3.53	6.16	4.10
2014	2.49	3.90	3.50	6.62	2.49
2015	2.45	5.30	3.24	6.10	3.62
2016	2.48	5.30	3.14	6.54	3.54

Source: Statistics Lithuania.

CONCLUSIONS

The food system has become more and more globalized and complex. As alternative approach to the current food system, the local food systems are often presented. Local food is perceived to provide a range of environmental, economic and social benefits. As Lithuania is a relatively small country, therefore domestic food could be regarded as local.

This study presents the methodology for the precise calculation of market shares of all and individual domestic dairy products on the internal market. The results obtained using this methodology are very useful for domestic dairy processors in the development of marketing strategies for their products and for government in launching various campaigns to support the national food sector.

In this study, the market shares of all and individual domestic dairy products in Lithuania over the last years were calculated and the underlying causes of market share changes were analysed. Between 2012 and 2016, the market share of all domestic dairy products in Lithuania decreased from 85% to 82%. The underlying cause of market share changes was linked to the differences in prices between domestic and imported dairy products. This was particularly obvious in 2013, when the prices of domestic dairy products increased at a higher rate than the prices of imported dairy products compared to the previous year, therefore the market share of all dairy products in Lithuania dropped from 85% to 80%. In 2016, as compared to 2015, when domestic dairy products became cheaper than imported dairy products, the market share of all dairy products in Lithuania rose from 79% to 82%.

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THE RELATIONSHIP BETWEEN FORESTRY STUDENTS'S MULTIPLE INTELLIGENCES AND THEIR EDUCATIONAL ACHIEVEMENTS

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Abstract

The main objective of this study was to investigate the relationship between forestry students' multiple intelligences and their educational achievements (passing the exams). Thirty four-year students form Forestry Specialization within Faculty of Agriculture from Bucharest participated in this research. The Multiple Intelligence Inventory proposed by Walter McKenzie in 1999 was used. The data set was analyzed through descriptive statistics. Moreover, correlations between the marks obtained by the students and their dominant intelligences types were done. The study provided preliminary and usefulness results which should be taken into consideration in teaching and learning activities, both by the teaching staff and the students.

Key words**:** *forestry students, multiple intelligences, educational achievements*

INTRODUCTION

In spite of many debates regarding a general definition for the term "intelligence", no standard or globally accepted one has been found until now. As a consequence, intelligence was defined in many ways, such as a mental ability for reasoning, problem solving and learning [6], the capacity for knowledge [12], or the ability to create products [11]. Furthermore, intelligence was regarded as the ability to think in an abstract manner [19]. It was also stated that the "intelligence is what is measured by intelligence tests" [5].

According to the latter definition, intelligence can be measured by several tests and their results can predict many social outcomes, such as job performance or educational achievements [6]. Even so, there are a few dissatisfactions among psychologists regarding the intelligence assessment instruments [1].

Three decades earlier, in 1983, Howard Gardner, psychologist and professor at Harvard University's Graduate School of Education, proposed the theory of multiple intelligences [10]. This theory was considered a very important contribution to cognitive science among psychologists [3] and it was successfully used in several fields of education [9].

According to this theory, all humans have more types of intelligences located in different areas of their brains. Every person possesses two or three dominant intelligences which he or she uses predominantly [20].

It is also well known that every person has the ability to develop several types of intelligences if he or she is encouraged and has the chance to follow an adequate and personal learning style [4]. In order to do this, the first step should be that both the students and the professors understand their own multiple intelligences and use the dominant ones during the learning and teaching processes. Moreover, the multiple intelligences can be grouped in three main domains, as follows: the interactive, introspective and analytical. The interactive domain consists of the kinesthetic, interpersonal and linguistic intelligences. In the introspective domain the visual, intrapersonal and existential intelligences are included, while the analytic domain consists of the naturalist, musical and logical intelligences [15].

Recently, due to the increasing scholarly and practical interests in the application of Multiple Intelligences Theory, an online environment

(Web-Ob application) especially for teachers and experts was developed [17].

However, during the last thirty years, there were many scholars who criticized Gardner's theory, but it must be admitted that it represents an important theory which influenced the education in the recent years [2] and challenged the traditional view on intelligence [14].

The main objective of this study was to highlight the types of intelligences of thirty forestry students. Secondly, correlations between the students' multiple intelligences and their educational achievements were made.

MATERIALS AND METHODS

Thirty fourth-year students from Forestry Specialization within the Faculty of Agriculture, University of Agronomic Sciences and Veterinary Medicine of Bucharest participated in this study during the beginning of October 2012. Most of them (83%) were between 21-23 years old.

In order to determine the students' types of intelligences the questionnaire proposed by Walter McKenzie in 1999 and available online, was used [24]. This test is divided into nine sections, as follows: Section **1** reflects the **Naturalist** strength, Section **2** suggests the **Musical** strength, Section **3** indicates the **Logical** strength, Section **4** illustrates the **Existential** strength, Section **5** shows the **Interpersonal** strength, Section **6** reflects the **Kinesthetic** strength, Section **7** indicates the **Verbal** strength, Section **8** reflects the **Intrapersonal** strength and Section **9** suggests the **Visual** strength [15]. Each section consisted of ten specific statements. The students completed each section by placing the value "1" next to the statement that exactly described them. Then they made the total for every section, ranging from 0 to 10 [24].

Regarding these nine intelligences it is well known from the literature that none of them is considered the most or the less important. They are considered personal tools and an individual can be more talented in some of them [16].

Basic statistics, such as mean, standard deviation (SD), minimum and maximum values and coefficient of variation were calculated by the aid of Microsoft Office Excel software package. In addition, correlations between the students' types of intelligences and their educational achievements were made with STATISTICA software, version 8.0. More precise, correlations between the marks obtained by the thirty students at two disciplines, namely Torrents' Control (**TC**) and Forest Land Reclamation (**FLR**) and their nine types of intelligences were performed. For both disciplines the written examination form was preferred thanks to its advantages in comparison to oral examinations. Firstly, it provides the possibility to examine a higher number of students in a limited period of time and, secondly, it helps the shy students [7, 21, 22]. The examination scale ranged from 1 (the lowest mark) to 10 (the highest mark).

RESULTS AND DISCUSSIONS

It can be seen in Table 1 that the highest mean values were obtained for sections 8, 6 and 1, namely the Intrapersonal, Kinesthetic and Naturalist Sections, respectively. This means that most of the students are very intuitive, they can learn through practical activities and they prefer the outdoor activities.

The benefits resulted from the latter activities consist of several useful field examples and a better understanding of how things work in a very dynamic and practical domain, such as Forestry.

On the contrary, the lowest mean values were obtained for sections 2 and 7, followed by sections 5 and 9, respectively. This means that the majority of the students does not possess or use very often the musical, verbal, interpersonal or visual abilities.

Among the nine sections, only for section 2 (Musical) the maximum score (10) was not recorded. Moreover, for this section the minimum value was observed (0).

The lowest value for the amplitude of variation (*i.e.* the difference between the maximum and the minimum values) was recorded for Naturalist Section. This could represent a huge benefit for a professor both in the teaching and evaluation processes because it is easier to

work with a homogenous group of students than with a heterogeneous one.

Table 1. Statistical parameters

Section	Mean	SD	Minimum	Maximum	CV [%]
1	**8**	1	6	10	14
2	5	2	0	8	38
3	7	1	4	10	20
4	7	2	4	10	25
5	6	2	2	10	34
6	**8**	2	4	10	23
7	5	2	1	10	42
8	**9**	1	5	10	16
9	6	2	2	10	38

The low values of standard deviation (SD) indicate that the data tend to be very close to the arithmetic mean [18]. In addition, the values of the coefficient of variation (CV), which were below 30-40%, indicate the homogeneity of the sample set and a normal (Gaussian) distribution. This means that the average (mean) values are representative for the data set [23]. The normal distribution was also reported in a recently published similar paper [8].

Regarding the values of Pearson's correlation coefficient (Table 2), which shows the strength and direction of the relationship between two variables [13], positive correlations (0.09 and 0.25, respectively) were recorded between the marks obtained by the students at both exams, namely **FLR** (Forest Land Reclamation) and **TC** (Torrents' Control) and their Intrapersonal strengths (Section 8). Actually, only for this section positive correlations with the marks from both exams were obtained.

Contrary to expectations, relatively low negative correlations (-0.12 and -0.02, respectively) were recorded between the marks obtained by the students and their Naturalist strengths (Section 1). This could be because of the fact that no outdoor activities, such as visits to degraded lands (*e.g.* terrains degraded by water or wind erosion or by extreme drought) or to torrential drainage basins, were provided during the teaching process.

Table 2. Correlations between variables

Var.		Section 1	2	3	4	5	6	7	8	9	FLR	TC
Section	**1**	1.00	0.41	0.50	0.61	0.04	0.34	0.48	0.31	0.63	**-0.12**	**-0.02**
	2		1.00	0.60	0.53	0.39	0.43	0.51	0.24	0.55	-0.19	-0.07
	3			1.00	0.54	0.27	0.61	0.49	0.36	0.70	-0.20	-0.06
	4				1.00	0.27	0.49	0.68	0.49	0.76	-0.08	0.04
	5					1.00	0.27	0.43	0.07	0.30	-0.46	-0.28
	6						1.00	0.45	0.62	0.68	-0.13	0.22
	7							1.00	0.30	0.73	-0.11	0.14
	8								1.00	0.36	**0.09**	**0.25**
	9									1.00	-0.24	0.06
FLR											1.00	0.64
TC												1.00

CONCLUSIONS

These preliminary results provided a precious clue regarding the dominant types of students' intelligences and their relationship to passing the exams. Better results were obtained especially by the students who possess intuitive skills and are able to make connections in order to solve different problems.

From a practical point of view, by taking into consideration the specific of the activities related to Forestry in general, and the distinctive practices involved by the two

disciplines, in particular, outdoor activities should be done. These will contribute to a better understanding by the students of the specific phenomena related with the two disciplines.

The usefulness of the written examination form in comparison with the oral one was demonstrated by the lowest mean value for section 7, which indicates the Verbal strengths. This means that the majority of the participants in this survey do not prefer to demonstrate or share their knowledge by using the verbal way.

In conclusion, as it resulted from this study, in order to obtain a higher percentage of students who will pass the exams, both professors and students should be aware of their dominant intelligences types and use them in the teaching and learning activities. Also, these results should be interpreted with precaution because of their relatively low representativeness.

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TECHNICAL ASPECTS REGARDING THE CLASSIFICATION OF PIG CARCASSES IN ROMANIA

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Abstract

The paper presents data on the classification of pig carcasses in slaughterhouses in Romania during the period 2009-2015. The three authorized methods of classification are: Zwei Punkte (ZP) - a manual method using the ruler used by small slaughterhouses that sacrificed less than 200 pig on the average weekly in the previous year; semiautomatic methods using the optical probe used in large slaughterhouses: Optigrade Pro (OGP) and Fat-o-Meat'er (FOM). Data were collected from the classification inspectors, which were synthesized, processed and analyzed dynamically on: the number of classified carcasses, the weight of carcasses classified by the three methods, the average carcass weight evolution, the average thickness of the fat layer, the thickness of the muscle eye and the average percentage of meat in the carcass depending on the classification method used.

Key words**:** *pig, classification of carcasses, methods, slaughter indicators*

INTRODUCTION

Classification of carcasses is a set of techniques and methods of assessing as accurately as possible the quality of pig carcasses according to the three major components: meat, fat and bones.
Classification of carcasses has begun in Europe since the 1930s and 1950s, because the need for farmers to use a method to allow a fair payment for animals delivered to slaughterhouses, correlated with their quality.
Thus, a technical means has been put in place to differentiate the value of the carcasses according to objective criteria and has created the mechanism to allow farmers to obtain different pay, correlated with the result of carcass classifications. [1, 4]

The application of objective methods of classifying pig carcasses to bovine carcasses, for example, could have been implemented due to the specificity of this species. A fairly accurate estimation of the lean meat content in the carcass who can be made on pigs based on the measurement of the muscle eye and the fat (subcutaneous fat). Methods of classification of carcasses must be authorized and statistically confirmed, according to the EU regulation. [7, 8, 9]
Now the EU established a common framework for the classification of animals carcasses. Generraly carcass classification serves as a quality development tool to encourage the breeding of animals, from which it is possible to get high results and a better quality of carcasses, both for processors and consumers. [5]

In Romania the carcass classification started on 01.03.2016 according to the European classification system EUROP, based on the differentiation of carcasses and their classification in quality classes depending to the estimated percentage of lean meat. [2]
Classification of carcasses has different purposes: [10]
-provides a common point of references between animal producers, wholesalers and retailers of meat. An "E" classed carcass in Germany is equivalent to an "E" classed carcasses in Romania, or in Spain, or in any other Member State in terms of lean meat content;
-allow producers to be pay fairly on the basis of the quality of the pigs delivered to the slaughterhouse;
-allows trading partners to sell and buy carcasses without seeing them: distance trade;
-ensures fair competition between slaughterhouses;
-contribute to market transparency;
-is the basis for reporting prices to the European Commission;
-allows price comparisons between Member States;
-due to the intervention mechanism of the European Commission on the market there is a standardization: a unitary system of carcass appreciation
-helps producers, through feed-back information, to improve carcass quality;
-helps processors to sort raw material.
Classification of carcasses is compulsory in all slaughterhouses that sacrifice pigs. All carcasses with weighing between 50 and 120 kg are compulsory to be classified, excluding those from pigs used for breeding. [11]
The methods used for grading pig carcasses are the methods for prediction of lean meat content. For prediction of lean meat content, authorized methods are used. [5]
The approved method is based on the dissection of at least 120 carcasses (representative sample of the national porcine population). The error margin (standard error of the RMSEP prediction) of the lean meat prediction should be less than 2.5.

MATERIALS AND METHODS

Three methods are currently used in the slaughterhouses in Romania for the classification of pig carcasses and the data obtained are transmitted to the Commission for Classification of Carcasses.
The Zwei Punkte (ZP) classification method is a manual grading method that uses the ruler and is only allowed for the classification of pig carcasses in slaughterhouses with a lower capacity license. Under current legislation, this method only applies to slaughterhouses which slaughtered in the previous year below the average of 200 pig heads/week.
The Optigrade Pro (OGP) classification method is one of the semi-automated methods of classifying pig carcasses for grading in authorized abattoirs of higher capacity. According to the legislation in force, this method is applied in slaughterhouses that slaughtered over the average of 200 pigs heads /week in the previous year.
The Fat-o-Meat'er (FOM) optical grading method, along with the Optigrade Pro (OGP) method, is one of the semi-automated methods of classifying pig carcasses which is used for the classification of carcasses in higher-capacity slaughterhouses (which have sacrificed over the average of 200 pigs heads/week in the previous year).
The data for the years 2009-2015 provided by the classification agencies and the independent classifiers authorized to carry out the pig carcass classification were collected, processed and interpreted. These data refer to the number of pigs carcasses and their quality, as assessed by the three approved classification methods. The results were properly interpreted and illustrated graphically.

RESULTS AND DISCUSSIONS

As a result of analyzing the number of pigs carcasses classified in all slaughterhouses in Romania in the period 2009-2015 there was a constant increase of their number from year to year. With the exception of a single year of regression (2010) in which the number of carcasses registered a decrease compared to the

previous year, the number of classified carcasses in all the other years of the mentioned period increased continuously.

In 2010, the number of classified carcasses decreased by 140,342 carcasses compared to 2009, thus, in 2010, 2,713,020 carcasses were recorded compared to 2,853,362 carcasses in 2009. The percentage of the decrease was 4,9%.

One of the reasons for the decline in the number of classified carcasses may be that 2010 was the year who no financial support was given to producers in the pig breeding sector.

Since the beginning of the carcass classification in Romania according to the EUROP system until in 2010, a significant subsidy for the pigs was granted. This grant was granted to implement the classification activity. The grant of the subsidy and the amount there of were directly linked to the classification of pig carcasses delivered to authorized slaughterhouses.

Subsidies also aimed to improve the biological material and also pig breeding systems and technologies. The subsidy was granted in a differentiated amount only for carcasses classified in the "U" and "E" classes. For carcasses classified in lower quality grades, respectively "R", "O" and "P" no subsidy was granted.

Also in 2010, in the context of the international financial crisis, there has been a decrease in purchasing power and implicitly consumption of pork meat.

Since 2011, the financial support to the pig breeding sector has re-started. Subsidies have been granted to improve the conditions for breeding and exploitation and for the welfare of pigs. The financial support received by farmers was followed by a re-start of the upwarding trend in the number of slaughtered pigs in authorized slaughterhouses in Romania.

The dynamics of the number of pig carcasses classified during the period 2009-2015 based on the data reported in all slaughterhouses in Romania is presented in Figure 1.

The number of carcasses registered in slaughterhouses increased from 2,853,362 carcasses in 2009 to 4,086,643 carcasses in 2015, the difference being 1,233,281 carcasses and 43.2% respectively.

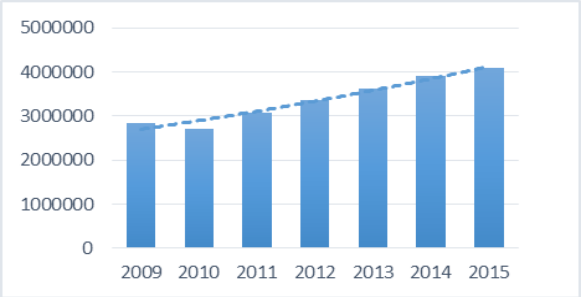

Fig. 1. Evolution of the number of pig carcasses classified in Romania between 2009 and 2015 (heads)
Source: own design based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

This significant increase in the number of carcasses classified in Romania is explained by the increase of the number of pigs raised in the country through the development of existing farms and the emergence of new breeding and fattening units (many of them being established by accessing European funds for the development of the agricultural sector).

An argument that supports the idea of the upward dynamics of the national pig breeding and fattening sector is the fact, that in 2009 in Romania there were classified 107,513 carcasses from fatty pigs from other countries representing 3.8% of the total carcasses, and in 2015 this number was 99,467 carcasses, that is, only 2.4%.

Comparative analysis of the carcass quality evolution determined by the three authorized methods. Study of the using of classification methods in the period 2009-2015

During the analyzed period, the weighting of the different classification methods used, from the total number of classified carcasses, varied from one year to the next according to Table 1 and Figure 2.

Table 1.The share of carcasses classified in Romania between 2009-2015 through the 3 authorized methods (%)

Method	2009	2010	2011	2012	2013	2014	2015
ZP	14.9	12.2	11	7.1	4.4	5.9	4.3
OGP	44.7	46	46.6	51.7	55.7	53.7	54
FOM	40.4	41.8	42.4	41.2	39.9	40.4	41.7

Source: own calculation, based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

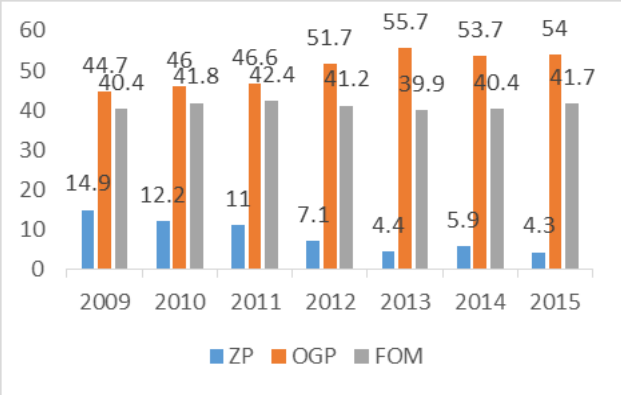

Fig. 2. The proportion of pig carcasses classified in Romania according to the method used (%)
Source: own design based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

Thus, the highest constant was recorded for the percentage of carcasses classified by the FOM method in the total classified carcasses, this percentage being around 40% (the lowest percentage being the one recorded in 2009 of 40,4% and the higher in 2011 of 42.4%).

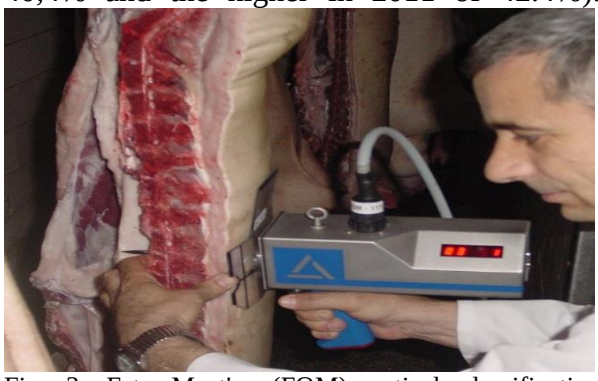

Fig. 3. Fat-o-Meat'er (FOM) optical classification method, 2016

Regarding the evolution of the quotas of the carcasses classified by the other two methods, there are observed larger differences over the analyzed period.
The OGP method has become increasingly widespread, increasing from a share of 44.7% of the total carcasses classified in 2009 to 54.0% in 2015, with the largest share being recorded in 2013, respectively 55.7%.
This increase in the weight of the carcasses classified by the OGP method was recorded against the background of the reduction of the percentage of those classified by the ZP manual method. The weight of the ZP-classified carcasses has steadily decreased during this period, from 14.9% in 2009 to just 4.3% of the total carcasses classified at national level in 2015.
This evolution was due to the fact, that in more and more slaughterhouses it was mandatory to replace the manual method of grading with a semi-automatic method due to the increase in the weekly average number of sacrificing pigs.
Of the two methods of classification with the authorized optical probe, the classification agencies and authorized independent classifiers have opted for the OGP method, probably because of its practical facilities: ease of classifying, mobility, and rapid processing of the measurements made

Fig. 4. Optigrade Pro (OGP) optical classification method, 2016

The comparative analysis of the evolution of the average weight of the carcasses classified by the three methods in the period 2009-2015

Evolution of average carcass weights in the study period shows, that the highest value is recorded in the FOM method, with over 80 kg, whereas for OGP and FOM methods the average weight was between 75.5 kg and 77.8 kg, according to Table 2 and Figure 5.
In case of all three methods it is shown an increase in the average carcass weights compared to the beginning of the analyzed period.
In the case of ZP and OGP methods, the carcass weight, as presented in the graph below, showed a certain uniformity over the analyzed period, while for the FOM method this parameter exhibits a greater variation from 80. 8 kg in 2009 to an average carcass weight of 87.8 kg in 2013.

Table 2. Evolution of the average weight of pig carcasses classified by the three methods, 2009-2015

Average carcass weight (kg)	2009	2010	2011	2012	2013	2014	2015
Method ZP	75.5	78.5	75	76.8	76	76.5	76.5
Method OGP	75.7	78	76.8	75.8	76.1	77	77.8
Method FOM	80.8	85.8	86	85.9	87.8	86	85.1

Source: own calculation, based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

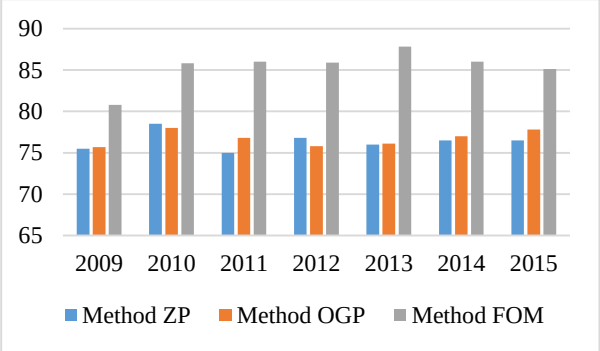

Fig. 5. Evolution of the average carcass weights according to the classification method (kg), in the period 2009-2015

Source: own design based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

Comparative analysis of the carcass quality according to the classification method used during the period 2009-2015

Comparative study of the carcass quality also involves the comparative analysis of the two indicators according to which, based on the calculation formulas, the percentage of lean meat, the thickness of the subcutaneous fat layer (bacon) and the muscle of the eye are estimated.

The situation of the data recorded by the three authorized methods regarding the average thickness of the bacon, expressed in millimeters, in the period 2009-2015 is presented in Table 3.

Also in this case, a similarity is observed with the evolution observed in case of weight analysis. Thus, the highest value is in this case also for FOM-rated carcasses with dimensions over 15 mm (between 15.2 mm in 2009 and 16.6 mm in 2013).

Also in terms of the uniformity in time of this indicator, the FOM method also recorded a greater variation from one year to the next, the difference between the minimum and the maximum being 1.4 mm.

Table 3. Average thickness of fat layer in pig carcasses, according to classification method (mm)

Average thickness of the fat (mm)	2009	2010	2011	2012	2013	2014	2015
Method ZP	13.4	14.2	13.5	13.3	13.1	12.9	13.2
Method OGP	14	14.6	14.4	14.1	14	13.5	13.3
Method FOM	15.2	16.3	16.2	16.1	16.6	15.9	15.2

Source: Source: Own calculation based on the statistical data from CCC EUROP.RO and Classification Agencies

For all methods. a tendency to improve during the last 3 years of the analyzed period was observed, in the direction of decreasing the thickness of the bacon.

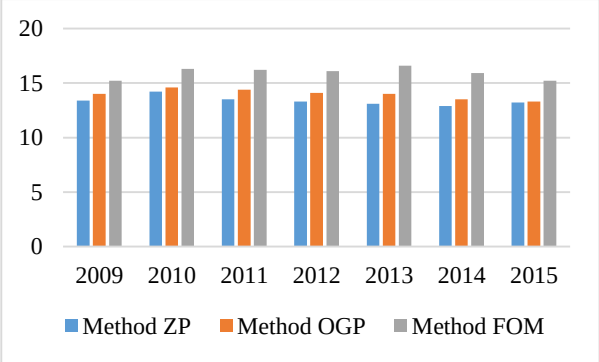

Fig. 6. Comparison of the average thickness of fat to the pig carcasses, according to the classification method, during 2009-2015

Source: own design based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

The second parameter measured and used to estimate the lean meat content of the carcass is the thickness of the muscle eye expressed in millimeters. The evolution of the thickness of the muscle eye according to the classification method used is presented in Table 4.

The muscle eye size has the highest mean value for the ZP method compared to the other two classification methods, in absolute values the differences being over 10 mm. This great difference in the size of the muscle eye determined by the ZP manual method compared to the two semi-automatic methods, with optical probe is explained by the fact that the manual method is used to measure the Gluteus medius muscle and in the case of the

other two methods, are used to measure the thickness of the Longissimus dorsi between the third and fourth last coast, at 7 cm from the midline.

Table 4. Evolution of the thickness of the muscle eye in pig carcasses (mm), between 2009-2015

	Year						
The thickness of the muscle eye (mm)	2009	2010	2011	2012	2013	2014	2015
Method ZP	68.8	69.1	69.1	67.5	69.2	69.2	67.8
Method OGP	57.7	57.7	57.4	58.7	59.6	59.2	59.1
Method FOM	57.9	58.5	59.8	60.6	61.6	62.6	60.8

Source: own calculation, based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

It is also noted for this parameter a continuous increase in quality in the case of methods of classification with the optical probe, FOM and OGP, the thickness of the muscle increasing from one year to the other, during the analyzed period.
In the case of the ZP method, the thickness of the muscle showed a certain non-uniformity, the lowest value being recorded in the middle of the analyzed time interval, 2012, also decreasing in the last year, 2015, compared to the previous years and the year 2009.

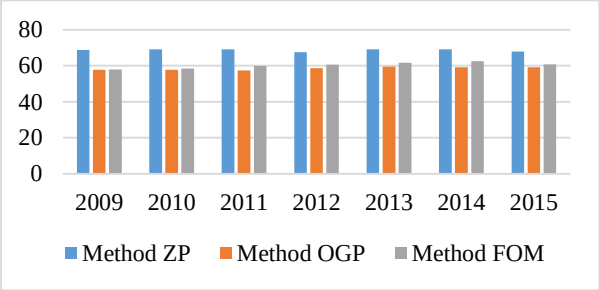

Fig. 7. Evolution of the thickness of the muscle in pig carcasses, according to the classification method, during 2009-2015
Source: own design based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

Finally, the study search at the evolution of carcass quality, the percentage of lean meat, estimated on the basis of the measurement of the two previously analyzed parameters, according to which the quality class are determined.

Fig. 8.The control of classification, 2016

The evolution of the average value of the percentage of lean meat in the carcass, according to the classification method analyzed over the period 2009-2015, is according to the data recorded by the slaughterhouse classifiers authorized, is presented in table 5.
Except for the last year of the analyzed period, it was noticed, that the highest percentage of lean meat in the carcass, and therefore the highest quality, was recorded each year for the ZP manual method.
In 2015, however, the carcasses classified by this method achieved the smallest percentage of lean meat compared to the other methods, the percentage being by 0.4 lower than those classified by the OGP method and by 0.6 against the FOM method.

Table 5. Evolution of the average value of lean meat in pig carcasses for the period 2009-2015

	Year						
The percentage of lean meat in pig carcasses	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Metoda ZP	59.6	59.1	59.6	59.3	59.9	60	59.5
Metoda OGP	59.1	58.7	58.8	59.2	59.5	59.8	59.9
Metoda FOM	59.6	58.7	59.1	59.3	59.2	59.9	60.1

Source: own calculation, based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

In the case of the two methods of optical probe classification, the data indicate a constant quality, the evolution of the lean meat percentage over time being approximating the same oscillations.

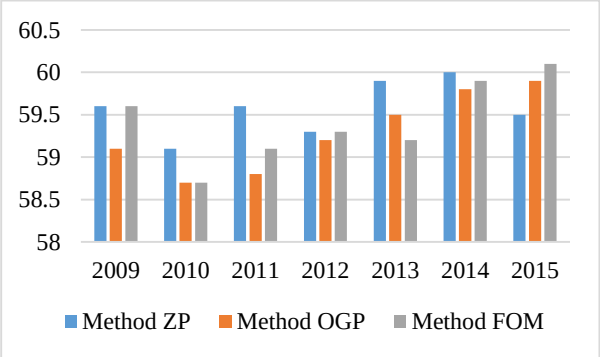

Fig. 9. Evolution of the average percentage of meat in the carcass by the classification method in the period 2009-2015
Source: own design based on the statistic data from CCC EUROP.RO, 2017 and from Classification Agencies

Although the average annual percentages of lean meat in those two methods are relatively close, there is a slight superiority in the quality determined by the FOM method over the PGI method, with the exception of 2013 (when a 59.5% in the case of the OGP method compared to 59.2% by the FOM method).

CONCLUSIONS

In Romania, the system of classification of pig carcasses, cattle and sheep was established in 2004, by governmental decision. [3]
The operation of the system is ensured by:
Carcass Classification Commission, Classification Agencies, Classifiers and Inspectors.
The Carcass Classification Commission manages the classification system and ensures its application. Classification of carcasses is carried out in slaughterhouses of independent classifiers or employees of classification agencies.
The Commission for Classification of Carcasses specifies the conditions under which the classification is made, licenses the classifiers and authorizes the functioning of the Classification Agency after it has been approved by ordinance to the Minister of Agriculture and Rural Development. The classification activity carried out in slaughterhouses is controlled by 10 regional inspectors for the classification of pig carcasses, cattle and sheep, coordinated by a chief inspector appointed by ministerial order.

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PROFESSIONAL AND SOCIAL ACTIVATION OF RURAL POPULATION IN POLAND – STRUCTURAL ASPECTS AND LEGAL FRAMEWORKS

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Abstract

The main aim of the article was to characterise the issue of professional and social activation of rural population in Poland from two crucial perspectives: of the structure of employment activities of rural population and of the set of legal measures designed to implement and assure desired levels of working activity of domestic rural population. The structural study focuses mainly on such aspects as a number of employed persons in agriculture, hunting and forestry with an indication of such issues as employment in crop and animal production and hunting, employment in agriculture, different status of employees or total number of registered unemployed persons living in rural area. In terms of structural aspects, it should be firstly noted that statistical data clearly shows that employment in agriculture in private farms is the most common form of employment of rural population. It should be also highlighted that the employer or own-account worker on private farm were the most common employment status for rural population in Poland. In terms of legal aspects, the study mainly focuses on analysis of complex legal provisions of both community and domestic law. The Regulation (EU) No 1305/2013 defines basic and fundamental principles of the Common Agriculture Policy related to the issue of professional and social activation of rural population, while domestic acts intend to define legal frameworks customised to Polish realities.

Key words**:** *professional and social activation, rural population, employment, working activity, registered unemployment, law, regulation, Poland, common agricultural policy.*

INTRODUCTION

Modern labour market requires from working population to be more flexible, qualified, skilled and prepared to constantly broaden knowledge and obtain now professional skills. Such requirements may be also related to the rural population that must keep pace with growing professional requirements, constant technological and agricultural market developments. Conservative and reluctant individuals have no future on modern market. Cultivation of land is not the only professional activity or rural population. We should understand professional activities of rural population as series of various mutually connected and complex activities representing agriculture, forestry and hunting sector.

Assuring proper education, qualifications and skills or rural population should be considered as one of the key tasks of the State in pursuing mature and reflective agricultural policy. Both, Community and Polish legislator seems to understand such need and dependency and introduce various measures and programmes within the Common Agricultural Policy (CAP) and the Rural Development Programmes (RDP) that are designed to offer various opportunities related to professional and social activation of rural population. Desired competitiveness of common agriculture requires from the Member States to assure sufficient financial schemes dedicated to develop rural areas and its populations. Such aim may be achieved also by appropriate activation programmes.

MATERIALS AND METHODS

The analysis of structural aspects of employment and unemployment in rural area in Poland was based on data coming from report of the Polish Central Statistical Office (CSO). The CSO publishes statistical yearbooks of agriculture or labour market, where the substantial data can be found and utilised in various researches [9, 10].

In terms of legal aspects, the study was based on the analysis of legal frameworks defining priorities and shaping measures necessary to fulfil professional and social activisation policies in both Poland and EU [4, 7, 8]. The author tries to both indicate specific priorities related to the issue of working activisation of rural population and identify fundamental measures dedicated to such priorities.

RESULTS AND DISCUSSIONS

Structure of employment and unemployment of rural population in Poland

(a)Structure of employment in agriculture, hunting and forestry

In years 2005-2015, approximately 16 % of total domestic working population was employed in agriculture, hunting and forestry sector (Table 1). Constant but slow growth in employment rates could be observed in case of in case of agriculture, hunting and forestry sector (from 2,134.1 in 2005 to 2,348.8 thousand persons in 2015)(Table 1). The vast majority of working activity in rural area was concentrated in crop and animal production and hunting, which represented from 97.6 % (in 2005) to 99.3 % (in 2015) of total employment in rural area (Table 1). However, it could be easily observed that agricultural sector with employment in private farms represented the biggest sector and the most popular form of employment in rural areas (from 94.2 % in 2005 to 96.3% in 2015)(Table 1). At the same time, membership in agricultural production cooperatives represented minor part of employment in agriculture sector and experienced constant decrease (from 0.7 % in 2005 to 0.4 % in 2015)(Table 1).

The data presented in the Table 1 allows to sketch preliminary structure of employment in rural areas. It seems that employment in all analysed agricultural sectors represent minor part of total employment on domestic market (approximately 16 %). However, despite indicated characteristics, employment in agriculture, hunting and forestry sector experienced constant growth in the analysed period (10% in years 2005-2015). It may prove that analysed employment sector is quite stable with a prospects of insignificant growth in next years.

Table 1. Employed persons in the economy and in agriculture, hunting and forestry sector in years 2005-2015

Specification	2005	2010	2013	2014	2015	Approx.
	Thousand persons					
Total	12,891.0	14,107.0	14,244.0	14,563.0	no data	13,951.3
Of which in agriculture, hunting and forestry sector						
Total	2,134.1	2,376.1	2,379.0	2,384.9	2,348.8	2,324.6
Of which crop and animal production, hunting						
Total	2,082.7	2,326.8	2,326.8	2,331.5	2,331.3	2,279.8
Of which in agriculture						
Total	2,082.2	2,326.2	2,326.7	2,331.4	2,331.2	2,279.5
Employed in private farms	2,009.4	2,262.6	2,262.6	2,262.6	2,262.6	2,212.0
Members of agricultural production cooperatives	15.3	11.8	10.6	10.3	9.7	11.5

Source: Statistical Yearbook of Agriculture 2016, Yearbook of Labour Statistics 2015, CSO [9, 10].

The statistical data coming from the Statistical Yearbook of Agriculture 2016 [10] allows also to present detailed characteristics of most popular forms of employment in agriculture in years 2005-2015. The CSO has identified three fundamental forms that are vastly utilised in domestic agriculture sector: employment on the basis of employment contracts, own-account working on private farms and membership in agricultural production cooperatives (Table 2).

It seems that acting as employer or own account worker on private farms is the most frequent form of working activity utilised in agriculture. Such status was enjoyed by the biggest number of employed persons in agriculture (from 1,967 thousands in 2005 to 2,216.2 thousands in 2015) (Table 2). This form of employment represented also from 94.5% (in 2005) to 95.3 % (2010) of total employment in agriculture in given period. What is more, the dominant form of employment experienced significant growth in years 2005-2014 with insignificant decrease observed in year 2015 (Table 2).

The form of employment contracts was the second most popular form of employment in agriculture and could be observed in up to 104.7 thousands cases (in 2015)(Table 2). Such numbers represented approximately 4,4 % of total employment in agriculture in Poland in analysed period (from 4.2 % in 2010 to 4.8% in 2005).

Working activity in the form of membership in agricultural production cooperatives was the least popular form of employment in agriculture in Poland in years 2005-2015 and represented approximately 0.5% of all working activities in agriculture in given period. Furthermore, this form of employment in agriculture seems to constantly loose its doubtful popularity, as its number is constantly decreasing (from 15.3 thousands in 2005 to 9.7 thousands in 2015 (Table 2).

Table 2. Employed persons in agriculture by employment status in years 2005-2015

Specification	2005	2010	2013	2014	2015	Approx.
	Thousand persons					
Total	2,082.2	2,326.2	2,326.7	2,331.4	2,331.2	2,279.5
	of which women					
	923.3	1,118.9	1,127.4	1,130.6	1,130.9	1,086.2
Employees hired on the basis of an employment contracts	99.0	97.4	99.2	104.3	104.7	100.9
	of which women					
	28.3	29.7	38.4	41.7	42.2	36.1
Employers and own-account workers on private farms in agriculture	1,967.0	2,216.2	2,216.2	2,216.2	2,216.2	2,166.4
	of which women					
	890.5	1,085.6	1,085.6	1,085.6	1,085.6	1,046.5
Members of agricultural production cooperatives	15.3	11.8	10.6	10.3	9.7	11.5
	of which women					
	4.3	3.5	3.2	3.1	2.9	3.4

Source: Statistical Yearbook of Agriculture 2016, CSO [10].

It is also worth to focus on the issue of women's participation in agriculture. As it appears from the statistical data (Table 2), working women play significant role in agriculture, representing almost half of working population in agriculture in Poland (from 923.3 thousands in 2005 to 1,130.6 thousands in 2015)(Table 2). Such number represents approx. 47.7 % of working population in agriculture in Poland in given period. Contrary to popular misconception, men's vantage on analysed filed is minor.

Similar trends in popularity of specific employment forms could be also observed in case of women, where own-account work was the most popular and membership in agricultural production cooperatives was least popular (Table 2). Such surprising trends in employment rate of woman of rural area proves also that the role of women in case of rural area is becoming more important [1, 6].

(b)Structure of unemployment in rural area in Poland in years 2005-2015

The unemployment is crucial a problem of any modern economy. Unemployment may be linked to such issues like poverty, public discontent and destabilisation or weaker performance of national economy. Stable unemployment rate may prove that given economy is stable and safe. In case of Poland, significant reduction of unemployment rate could be observed in analysed period as the total number of registered persons decreased from 2.7 million in 2005 to 1.8 million in 2015. However, it should be as highlighted that such trend was not constant as significant growth was recorded in period between 2010 and 2013 (over 200 thousands) (Table 3). The economic crisis was the most probable cause of such phenomenon. At the same time, the lowest unemployment rate in modern Poland was recorded in 2015 (Table 3).

The same observation can be applied to unemployment rate of rural population. Total number of unemployed in rural area declined in given period by approx. 480 thousands, while in specific period of years 2010-2013 the increase could be recorded (by almost 100 thousands)(Table 3). Having regard to such statistical data, it is clear that the issue of unemployment in rural areas should be considered as real and crucial issue for Polish economy and society. The data presented in Table 3 also allows to analyse detailed age structure of unemployment in rural areas. Firstly, it could be easily observed that the highest unemployment rate was recorded in the case of rural population aged 25-34 (Table 3). The second strongly represented group was aged 24 and less, and the third one was aged 35-44 (Table 3). As it appears, majority of the unemployed rural population in years 2005-2015 was in production age. Such data proves also that the problem of unemployment in rural areas should be mainly related to younger population.

Table 3. Registered unemployed persons by place of residence, age and sex in years 2005-2015

Specification	Total	*Of which living in rural area*					
		Total	*by age*				
			24 years and less	25-34	35-44	45-54	55 years and more
	Thousand persons						
2005	2.773.0	1,180.4	317.8	342.2	242.1	232.3	46.1
2010	1,954.7	856.4	232.2	247.3	155.4	153.7	68.0
2013	2,157.9	954.8	229.4	274.0	182.4	164.0	105.1
2014	1,825.2	812.1	176.2	233.4	159.4	140.0	103.1
2015	1,563.3	701.6	140.4	200.7	139.3	121.0	100.3

Source: Statistical Yearbook of Agriculture 2016, CSO [10].

Quite interestingly, the opposite trend was recorded in case of unemployment rate of older rural population, as the number of registered unemployment persons aged 55 years and more significantly increased, from 46.1 thousands in 2005 to 100.3 thousands in 2015 (Table 3). Despite general decreasing tendency in case of both total working population and

rural population, unemployment in case of older rural working population is becoming more important issues. However, higher unemployment rate in case of such working group may be linked to growing popularity of transferring farms to younger generations and improving social security standards.

Legal frameworks of professional and social activation of rural population in Poland

(1)Professional and social activation of rural population as one of the priorities of the Common Agricultural Policy for years 2014-2020

The Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17th December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005 directly defines such aspects as common mission, objectives and unions priorities of Common Agricultural Policy and EAFRD's in the field of rural development [4]. According to the Article 3 of the Regulation, the EAFRD was created in order to contribute to the Europe 2020 Strategy through promoting sustainable rural development in EU as a complementary measure to other measures of the CAP, the cohesion policy and common fishery policy [4]. The EAFRD shall promote such important aspects of agriculture as better development in territorial and environmental aspects, more climate-change-resistant and eco-friendly rural economy or its more competitive and innovative character [4].

The Regulation clearly defines three basic goals of the CAP in the field of rural development:

(i)fostering the competitiveness of agriculture;
(ii)ensuring the sustainable management of natural resources, and climate action and
(iii)achieving a balanced territorial development of rural economies and communities including the creation and maintenance of employment (Article 4)[4].

As it appears, one of the top development priorities of current CAP is to assure and foster proper working and social status of rural communities. It seems that applying proper measures related to the issue of professional and social activation of rural population may be appropriate instrument to achieve the so defined goal of the CAP.

The Regulation also defines numerous union priorities on the field of development of rural areas, among which there are several that are related to the issue of professional and social activation of rural population [4]. For instance, there are such thematic objectives as:

(i)fostering lifelong learning and vocational training in the agricultural and forestry sectors (Article 5(1)(c)),
(ii)facilitating the entry of adequately skilled farmers into the agricultural sector and, in particular, generational renewal (Article 5(2)(c)) or
(iii)promoting social inclusion, poverty reduction and economic development in rural areas, with a focus on the following areas by facilitating diversification, creation and development of small enterprises, as well as job creation, fostering local development in rural areas and enhancing the accessibility, use and quality of information and communication technologies (ICT) in rural areas (Article 5(6)(a)(b)(c))[4].

The so-defined union priorities in the field of rural development are clearly linked to professional and social activation of rural population. Is seems that assuring proper working environment of rural population is one of the top priorities of the European Union.

(2)Rural Development Programme for years 2014-2020 in Poland

Rural Development Programme (RDP) for years 2014-2020 in Poland in coordinated by the Ministry of Agriculture and Rural Development. Particular measures, instrument, competent bodies, principles of funding and fulfilling the CAP, specific tasks and goals are regulated under two fundamental acts (Act on financing common agricultural policy of 27th May 2015 and Act on promoting the development of rural areas with the European Agricultural Fund for Rural Development under the Rural Development Programme for years 2014-2020) and numerous implementing regulations [7, 8]. According to data coming from the Ministry, current RDP consist of approx.. 13,612,211,428 EUR, including 8,697,556,814 EUR from EAFRD and 4,914,654,614 EUR from national contribution

[2]. There are 15 directly defined tasks to achieve under current RDP, including specific ones related to professional and social activation of rural population in Poland [2]. For instance, Polish RDP intends to develops such aspects as:

(a)creating employment opportunities outside agriculture without a need to change place of residence through reduction of unemployment rate, fostering entrepreneurship, improving transportation conditions and creating new opportunities of teleworking,

(b)enhancing professional skills and qualifications of rural population,

(c)developing farm helper services, professional advisors in fields of professional and social skills, technology and innovation,

(d)implementing programs for vocational trainings of rural populations,

(e)promoting and developing new sectors such as food processing and agricultural marketing or

(f)implementing specific funding and premium rules that promote young farmers and rural individuals trying to initiate non-agricultural professional activity [3]

The premium programme for young farmers is the first RDP scheme linked to the issue of professional and social activation [3]. Entitled young farmers (applicant to 40 years of age) may apply for financial aid in order to set up an agricultural holding. The aid shall be utilized in order to develop agricultural activity or to prepare for sale of agricultural goods [3]. The aid is granted in the form of financial premiums of 100,000 PLN, paid in two instalments (1^{st} – 80% of aid, 2^{nd} – 20%)[3]. Beneficiaries of previous RDP programme (for years 2007-2013) cannot apply in current scheme [3]. The scheme is designed to encourage young rural population to initiate and continue professional activity in rural area through appropriate financial boost.

Another significant scheme is designed to restructure small farms. Financial aid granted under the programme should be spent on measures that will improve competitiveness and profitableness of given agricultural holding through increase of economic size of farm, especially by the switch of production profile [3]. Financial aid under the scheme is granted in the form of premiums of 60,000 PLN (but no more than 15,000 EUR), paid in two instalments (1^{st} – 48,000 EUR, 2^{nd} – 12,000)[3]. This form of aid should be considered as an appropriate motivating measure that intends to maintain agricultural activity of rural population.

The modernization of agricultural holding is another financial scheme that may be linked to the issue of professional activation of rural population in Poland. This programme is designed to support specific investments that aim to improve total productivity of agricultural holdings engaged in gainful agricultural activity [3]. Total productivity should be defined as an improvement of profitableness and competiteveness of given farm [3]. Financial aid should be spent in order to obtain certain GVA increase, by at least 10% in 5 years, as regards the base year for the granted aid [3]. The aid is granted in the form of partial refund of paid eligible expenses (up to 60% in case of young farmers, 50% in case of other applicants) [3]. Maximum refund is:

(a)900,000 PLN in case of investments concerning development of pig production,

(b)500,000 PLN in case of investments on feed stores or other inventory buildings or

(c)200,000 PLN in case of other investments [3].

Current RDP also intends to improve opportunities of rural population to initiate other-non-agricultural professional activities. In order to achieve so-defined goal, new programme was introduced that offers financial aid for staring non-agricultural gainful activity [3]. The aid is granted in the form of financial premiums of 100,000 PLN, paid in two instalments (1^{st} – 80% of aid, 2^{nd} – 20%). Firs instalment is paid within 9 months since delivery of granting decision. Second one is paid after 3 years [3]. Applicants are required to present appropriate business plans and beneficiaries of RDC 2007-2013 or of the Young Farmers Premiums Programme cannot apply [3]. This is the most important activation programme that creates great opportunity to star other professional gainful non-agricultural activity.

The last scheme operating under current RDP is programme designed to assure desired levels of knowledge transfer and professional information services for rural population. This scheme introduces set of professional trainings that are designed to improve professional skills and knowledge of rural population in Poland. Trainings should transfer knowledge related to such issues as: managements, marketing, occupational safety in agriculture and forestry, organisation of production and technology, accounting, insurances in agriculture, use of financial instruments, environmental and climate protection, cooperatives or producer grouping [3]. In this case, only research centres, universities, public advisory bodies, territorial or state administrative bodies or training enterprises may apply to be a beneficiary and obtain financial aid in form of total refund of eligible cost spent on knowledge transfer and training activities[3]. This programme intends to improve non-material opportunities of rural population through improvement of qualifications and professional skills.

CONCLUSIONS

Individuals employed in agriculture, forestry and hunting sector represent relatively small group of Polish working population. However, it does not mean that rural working population should be considered as a minor working group. We should remember that such small number of agricultural workers assure that total Polish society has sufficient access to basic needs in the form of food.

The biggest agricultural working group works in agriculture sector with a centre in private farms. Vast majority of rural population performs professional activities as employers or own-account workers on private farms. As it appears, majority of agricultural workers prefer to work on their own farms. Other forms of professional activity are less popular and remain stable (employment contracts) or even are losing its popularity (agricultural production cooperatives). At the same time, unemployment rate among rural population experienced serious reduction (almost 1 million in 10 years) in analysed period.

Accession and various schemes within the CAP seems to significantly improve welfare and status or rural population, especially through higher incomes, more advance technology or new working opportunities. However, the issue of unemployment still mostly influence working rural population in the middle of working age. Future CAPs and RDP should devote more attention to this issue. Generational changes in mindset of rural population cause also that unemployment rate among older rural generation is increasing.

Tu sum up, the CAP for years 2014-2020 seems to recognise importance of the issue related to professional and social activation of rural population, defining new and specific mission, goals and union priorities. It is obvious that appropriate financial schemes may influence current status of rural population and may be a key factor in creating new working opportunities in agriculture and forestry. Polish legislator also seems to understand this regularity and introduces series of programmes related to the issue of professional and social activation of rural population. However, at current stage, it is impossible and purposeless to assess influence of such schemes. The future will review whether current measures of the CAP and the RDP were effective in achieving defined goals and priorities.

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STATE AID SCHEMES FOR SMALL-SCALE AGRICULTURE IN POLAND UNDER RURAL DEVELOPMENT PROGRAMME FOR YEARS 2014-2020

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Abstract

The main aim of the article was to present basic data concerning the issue of state aid schemes for small-scale agriculture in Poland under current Rural Development Programme for the period 2014-2020. The research concerns such issues as: definition of small farms, structure of agricultural holdings in Poland by area group of agricultural land and economic size classes or basic state aid schemes designed for small-scale agriculture. Firstly, it should be highlighted here that there is no uniform definition of small farms under Polish legal system and different researchers propose various definitions. In terms of structural issues, it should be noted that smaller agricultural holdings are dominant group of farms in Poland. Such regularity may be also observed in case of economic size classes, where majority of farms represented lower economic size classes. Finally, it is worth noting that the State offers various aid schemes that are designed to foster, promote and stimulate development of small-scale agriculture in Poland.

Key words**:** *state aid schemes, small-scale agriculture, small farms, area groups of agricultural land, economic size classes, Rural Development Programme*

INTRODUCTION

Small-scale agriculture is a key characteristic of modern Polish agricultural landscape. Vast part of agricultural land is concentrated in numerous farms owned by a large number of farmers. It simply means that agricultural land in Poland is relatively fragmented and large-land holding is a rare phenomenon. However, we should remember that such characteristic of Polish agricultural landscape has some serious implications and consequences as small-scale agriculture requires adopting specific and precise legal measures. Measures that would assure that small farmers shall obtain appropriate aid from the State. Suitableness of such aid simply means that it should foster development of small farms, assuring that such farms are competitive and innovative. These features are extremely important to assure the survival of small-scale agriculture in competition with large-scale agriculture. This is the main reason why various aid schemes were adopted under the Rural Development Programme (RDP) that are dedicated to the small-scale agriculture.

MATERIALS AND METHODS

The analysis of structural aspects of agricultural land in Poland from the perspective of area groups of agricultural land and its economic size classes was based on the data coming from the reports of the Polish Central Statistical Office (CSO). The CSO publishes statistical yearbooks of agriculture, where the substantial data can be found and utilised in various researches [11]. Furthermore, the CSO periodically publishes also specific reports on the topic of characteristics of agricultural holdings in Poland [1].

In terms of state aid schemes for small-scale agriculture, the study was based on the analysis of legal frameworks pointing the direction and shaping specific programmes that were introduced under both Polish and EU legal systems [6, 7, 8, 9]. The author tries to present and evaluate specific state aid schemes for small-scale agriculture that were adopted under the Polish law. In order to achieve so-defined

goal it was necessary to analyse various provisions of different legal acts.

RESULTS AND DISCUSSIONS

The definition of "small farms"

There is no legal definition of term "small farm" in any legal act biding under the Polish legal system. Different researchers propose different definitions that are shaped by different determinants and variables [2, 10]. In order to define the term 'small farms', it is proposed to use following variables:

(a)physical surface area of a holding, where different area groups represent different size of agricultural holding,

(b)workload (labour input) of a holding, where small farms are characterised by higher workload per 1 ha of land calculated by a division of hours actually worked in the year by hours corresponding to full-time employment,

(c)market share of a holding, estimated by a percentage of production used for own purposes and

(d)economic size classes determined by European Size Unit (ESU), where small farms are defined as farms having less than 1, less than 4 or less than 8 ESU [2, 10].

The last method that adopts the ESU measure seems to be the most popularised measure in the EU. Due to such fact, this method also seems to be most suitable in the research.

Structure of farms in Poland

(1)Area groups of agricultural land in Poland

The CSO divides agricultural holdings into 8 following area groups:

a) up to 1 ha,
b) 1.01 - 1.99 ha,
c) 2.00 – 4.99 ha,
d) 5.00 – 9.99 ha,
e) 10.00 – 14.99 ha,
f) 15.00 – 19.99 ha,
g) 20.00 – 49.99 and
h) 50 ha and more (Table 1)[11].

It may be observed that small farms, within group (from up to 1 ha to 9.99 ha), represent vast majority of agricultural land in Poland, shaping over 75% of total agricultural landscape (Table 1). The great majority of agricultural land was concentrated if farms of area between 2.0 and 4.99 ha (approx. 32% of total agricultural land)(Table 2). The area groups of 5.00 – 9.9, was second the biggest area group (approx. 23 % of all agricultural groups), while area group of 1.01 – 1.99 ha was third most popular group (approx. 19% of all agricultural land). Large agricultural holdings (area of 50 ha and more) are very rare in case of Polish agricultural landscape (only 2% of total land area)(Table 1).

Furthermore, it should be also noted that changes in number or percentage of given area groups of agricultural land were significant and a share of each area group remained relatively stable. The biggest change could be observed in a case of the smallest (up to 1 ha) and biggest area groups (50 ha and more), where its shares increased respectively by 0.8% in case of the smallest farms (in years 2010-2013) and by 0.7% in case of the biggest farms (in years 2010-2015)(Table 1).

Such regularities may prove that Polish agricultural land is owned by many farmers, who run numerous but relatively small agricultural holdings. This is a dominant type of farmer in Poland and fundamental characteristic of Polish agricultural landscape. It also simply means that family-based farming is a type of agriculture preferred by both the State and Polish society.

It may be observed that average Polish farmer prefers to transfer his/her agricultural holding to closest family rather than to sell it to bigger market player.

Also the State tries to maintain such landscape, mainly through legislature limiting freedom of selling agricultural land. Such social preferences and legal obstacles cause that the number of agricultural holdings in Poland remains relatively stable and experiences only minor fluctuations. It also proves that agricultural population has a conservative attitude towards agriculture and land ownership.

Table 1. Farms by area groups of agriculture land

Years	Total	With agricultural land area							
		Up to 1 ha	*1.01 - 1.99*	*2.00 – 4.99*	*5.00 – 9.99*	*10.00 – 14.99*	*15.00 – 19.99*	*20.00 – 49.99*	*50 ha and more*
Total in absolute numbers									
2010	1,509,148	24,876	300,590	489,772	346,321	151,517	72,019	97,029	2,704
2013	1,429,006	34,375	277,572	455,268	315,227	141,295	70,203	103,246	31,820
2015	1,409,649	27,621	253,668	453,354	322,590	145,859	71,376	102,270	32,910
In percent (%)									
2010	100.0	1.6	19.9	32.6	22.9	10.0	4.8	6.4	1.8
2013	100.0	2.4	19.4	31.9	22.1	9.9	4.9	7.2	2.2
2015	100.0	2.0	18.0	32.2	22.9	10.3	5.1	7.2	2.3

Source: Statistical Yearbook of Agriculture 2016, CSO [11].

(2)Agricultural holdings in Poland by economic size classes

The CSO in its research characterising agricultural holdings [1] has adopted 10 following economic size classes of agricultural holdings:

(a)0 – 2,000 EUR,
(b)2,000 – 4,000 EUR
(c)4,000 – 8,000 EUR
(d)8,000 – 15,000 EUR
(e)15,000 - 25,000 thousands EUR
(f)25,000 – 50,000 thousands EUR
(g)50,000 - 100,000 thousands EUR
(h)100,000 - 500,000 thousands EUR
(i)500,000 - 1,000,000 thousands EUR
(j)1,000,000 thousands EUR and more.

As shown in Table 2, there is obvious trend concerning economic size classes of agricultural holdings in Poland. It seems that lower economic size class is related with higher number of agricultural holdings, while higher economic class should be linked with lower number of agricultural holdings. In case of Poland, the most represented group of agricultural holdings was assigned to the lowest ESU (0 - < 2 thousands EUR), representing 28.2% of all agricultural holdings [1]. The second most common ESU was the ESU of 2 - < 4 thousands EUR (19.8%)(Table 2)[1]. The third popular ESU in case of Polish agricultural holding was ESU of 4 - < 8 thousands EUR (Table 2). At the same time, only 2% of agricultural holdings in Poland could be characterised by the ESU of 100 thousands EUR and more (Table 2)[1]. As it was indicated above, higher ESU comes with lower number of so-classified agricultural holdings, while lower ESU shall be related with higher number of so-classified agricultural holdings.

Taking into account the data from Tables 1 and 2, it should be noted that Polish agricultural landscape is shaped by small farms in terms of both economic and area size classes [1]. The most common type of farm should be characterised by agricultural area of 2.00 - 4.99 ha and ESU of 0 - < 2 thousands EUR (Table 1, Table 2). Furthermore, as the CSO indicates in its report, majority of agricultural holdings assigned to lowest ESU were also characterised by lowest area group, as almost

58% of agricultural holdings classified to ESU of 0 - < 2 thousands EUR possessed agricultural area below 2 ha [1]. Such regularities clearly indicate that small area of agricultural land may be linked with low ESU. It also proves that the State should adopt such financial measures that would be designed to improve economic score of smaller agricultural holdings through its development, better competitiveness, innovative technology and unification or co-operation of such holdings.

Table 2. Number of agricultural holding by economic size classes (ESU) in Poland in 2013

Specification	Total	Private sector		Public sector
		Total	Of which individual farms	
Total	1,429,006	1,428,366	1,425,386	640
0 – 2,000 EUR	402,781	402,717	402,578	64
2,000 – 4,000 EUR	283,509	283,469	283,338	40
4,000 – 8,000 EUR	262,110	262,055	261,899	55
8,000 – 15,000 EUR	183,607	183,542	183,400	65
15,000 – 25,000 EUR	113,031	112,971	112,837	60
25,000 – 50,000 EUR	108,333	108,248	108,011	85
50,000 – 100,000 EUR	50,619	50,557	50,305	62
100,000 – 500,000 EUR	22,598	22,495	21,494	103
500,000 – 1,000,000 EUR	1,564	1,526	1,070	38
1,000,000 EUR and more	856	788	456	68

Source: Characteristic of agricultural holdings in 2013, CSO [1].

State aid schemes for small-scale agriculture in Poland

(1)Catalogue of state aid schemes for small-scale agriculture in Poland

The Ministry of Agriculture and Rural Development indicates that under the RDP for years 2014-2020 there are 10 following programmes dedicated to small-scale agriculture:

(a)restructuring small agricultural holdings,
(b)modernisation of agricultural holdings,
(c)premium for starting non-agricultural activities,
(d)organic agriculture,
(e)agri-environmental-climatic programme,
(f)establishing producer groups,
(g)agricultural products and foodstuffs quality systems,
(h)counselling services and
(i)LEADER approach [4].

It seems that restructuring of small agricultural holdings, establishing producer cooperatives and counselling services should be considered as three the most important schemes for small-scale agriculture in Poland that operates under current Rural Development Programme. These three schemes are directly dedicated to small-scale agriculture and are designed to foster small agricultural holdings, stimulating its development, innovation and competitiveness.

(2)Restructuring small agricultural holdings

Financial aid offered under the scheme is designated to finance business plans directly related to restructuring small agricultural holdings [4]. Applicants have to indicate that the aid will be used to develop agricultural production and that such investment will cause significant growth in income of such agricultural holding [4].

The applicant is required to possess at least 1 ha of agricultural land and the economic size of such agricultural holdings has to be below 10,000 EUR (§ 2 p. 1(a)(b) of Regulation)[7]. As it appears, only small-scale farmers, defined with the ESU, can be beneficiaries of the scheme.

The business plan is the most important document required under the scheme. The applicant is required to both fully characterise his/her agricultural holdings and precisely describe planned investments. The data about such issues as: area and type of agricultural land, structure of production, economic size class of agricultural holding, estimated value of investment, description of planned activities or characteristic of qualifications and professional skills of applicant (§ 3 of Regulation)[7].

The aid shall be granted only for planned investments regarding restructuring agricultural holding in terms of food and non-food production or preparation to sell agricultural products produced in the holding in the form of:

(a)fixed asset investment,

(b)participation in professional training,

(c)use of counselling services or

(d)participation in organised form of cooperation of agricultural producers, especially in order to deliver more products and prepare it to sale on market (§ 4 p.1 and 2 of Regulation)[7].

The Regulation also defines required effects of granted financial aid. As the § 4 p. 3 of the Regulation indicates, the investment has to result in defined increase of economic size of the agricultural holding to at least 10,000 EUR and at least 20% compared to baseline value [7].

The aid shall be granted in amount of 60,000 PLN, but it should not exceed the sum of 15,000 EUR and its paid in two instalments (first – 80% of granted aid, second – 20%)(§ 5 of Regulation)[7].

The first instalment is paid upon a motion that has to be filed within the period of 9 months since the delivery of granting decision. The payment of the first instalment should be succeeded within 90 days from a motion.(§16 and 17 of the Regulation)[7].

The second instalment is also paid upon a motion that indicates accomplishment of the business plan and the payment should be succeeded within 90 days from a motion (§ 18 and 19 of the Regulation)[7].

The Agency for Restructuring and Modernisation of Agriculture is the key body under the scheme. Regional directors of the Agency are responsible for such issues as: issuing granting or rejecting decision, assessing applications or establishing order of aid applications (§ 8-15 of Regulation)[7].

To sum up, as it appears, the restructuring programme for small agricultural holdings is designed in order to improve position of such holdings through financial sources that should be spent on defined investments.

Those investments are expected to have specific results in form of development of small-scale agriculture.

Beneficiary holding should be more developed, innovative and competitive in terms of agricultural production and sale, while farmers are expected to be more qualified and skilled through series of professional trainings and counselling services.

(3)Establishing producer groups

The fundamental goal of the programme is to consolidate agricultural producers by reducing supply chains through elimination of intermediaries [4].

Such policy should result in increase of both a cost-efficiency of production and income of farmer [4].

The State claims that the programme is dedicated especially to small-scale farmers who should be able to offer more competitive and qualitative product [4].

The aid is granted in form of the lamp sum (flat-rate) estimated on the basis of the value of documented annual net revenue (of the production group) from sale of products or group of products produced in agricultural

holdings of farmers – members of the production group (§ 14 of the Regulation)[8].
The aid is paid in 5 instalments in period of 5 years of groups' activity and it amounts to:
(a)after 1st year of activity – 10%,
(b)after 2nd year of activity – 8%,
(c)after 3rd year of activity – 6%,
(d)after 4th year of activity – 5%,
(e)after 5th year of activity – 4% of the value of documented annual net revenue (§ 14 p. 2 of the Regulation)[8].
At the same time, total financial aid for given production group should not exceed the sum of 100,000 EUR [4].
Only existing producer groups that associate famers-natural persons may request such form of state aid [8]. Each applicant files detailed business plan, which is a basis of both evaluation of given application and later administrative decision [8].

(4)Counselling services

The State claims that counselling services programme is an extremely important part of current RDP scheme [4]. Appropriate and professional counselling services should result in such effects as:
(a)improvement of economic efficiency of agricultural holding,
(b)its better environmental friendliness and
(c)its stronger resistance to climate changes [4].
The service provider is a direct beneficiary of financial aid but only farmers and production group can use such services (free of any charge)[4].
The Ministry of Agriculture and Rural Development informs that counselling services should include such topics as:
(a)obligations concerning management and norms related to good agricultural and environmental condition,
(b)agricultural practices related to climate and environment,
(c)modernisation, competitiveness, innovation and entrepreneurship of agricultural holdings,
(d)requirements related to implementation of Directive 2000/60/EC and Regulation (EC) 1107/2009,
(e)occupational safety standards and
(f)specific counselling services dedicated to farmers staring agricultural activity for the first time [4].

CONCLUSIONS

Typical Polish agricultural holding can be characterised by two features: small area of agricultural land and low economic size class. This is the agricultural landscape of Poland, where many farmers possess many small agricultural holdings. Big farm with both agricultural area of 50 ha and more and high economic size class is an extremely rare phenomenon in case of Poland.
Such image of agricultural landscape prove that it is necessary for the State to adopt such aid measures that would reach the biggest possible number of beneficiaries. As it appears from the statistical data presented in the research, the easiest way to achieve so-defined goal is to design specific schemes that are directly dedicated to small-scale agriculture and agricultural population directly connected to such size of agricultural land.
However, it is also important to promote agriculture that is innovative, environmental friendly and climate resistant. Appropriate state aid schemes operating under the RDP should offer only complex measures that would assure achieving all goal defined under the Common Agricultural Policy. Small-scale agriculture should not obtain "easy money" for day-to-day activity but it should be a direct recipient of precise state aid schemes promoting such issues as development, innovation, quality and environmental awareness of agriculture.

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INVESTIGATION OF INFLUENCE ON THE FLOTATION SEPARATION TYPICAL CHARACTERISTICS PEARL WINE MATERIALS

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Abstract

The article considers a method for improving the typicality of pearl wine by storing them in a natural surfactant. According to our research task, we tried to use technology in the production of wine pearl surface flotation separation method, which is used in other industries. In the industrial laboratory of LP "Nur" assemblages of raw pearl wine Rkatsiteli and Kuldja exposed surface flotation separation with the separation of the foam fraction.

Keywords**:** *pearl wine Rkatsiteli and Kuldja, flotation separation*

INTRODUCTION

Sparkling wine pearl belong to this type of wine, which, when over-pressure lifting have the ability to excrete carbon dioxide and form a stable foam. Available in sparkling pearly wine surfactants characterizes these interrelated processes.

According to the literature, studies have been conducted, which were aimed at the study of the mechanism of interaction of surfactants wine with a molecule of carbon dioxide enrichment and development of methods of wine substances possessing surface activity [1, 4].

The concentration of natural surfactant decreases when the wine material is subjected to a number of technological treatments: exposure, fining, cold processing, filtering, [9]. In this connection, the attempt to make up for the loss of natural blowing agent by entering the wine in a blend of artificial foam stabilizers which correspond to the control requirements, the validity of this point of the question [5, 7].

But there is also the other side, the presence of blended synthetic substances raises some technical difficulties: from the formation of the bouquet and taste of wine before its state of aggregation.

In our studies, there was a task - to develop a method of improving the typicality of pearl wine by storing them in a natural surfactant. According to our research task, we tried to use technology in the production of wine pearl surface flotation separation method, which is used in other industries [9].

Removing the dissolved ASS (active substance superficial) is theory flotation processes based on their adsorption on the surface of the gas bubble and thereafter separating the resulting froth fraction [3,9].

MATERIALS AND METHODS

The wine or must is diluted so that the solution contained approximately 0.2 ± 0.35 g of sugar per 100 ml. Prepared for the analysis solution is poured into a burette. In a conical flask, measure 100-150 ml of 5 ml of Fehling's solutions I and II. Then, from the burette pour 18.0 - 18.5 ml of test solution is boiled for exactly 2 minutes and add 1 to 2 drops of methylene blue. If the blue color disappears once, the test solution was diluted with enough and should be diluted further 2 times. If the blue color persists, then the liquid is boiling, continued boiling, the solution was added drop wise from a burette until the disappearance of the blue color. This titration is considered tentative. Burette made up to zero defining features and repeated but this time the flask was poured into almost the entire required amount of the test solution (0.5 ml less than gone on tentative titration). After two minutes

of boiling, add methylene blue and titrate to the disappearance of the blue color.

By volume consumed for the titration of the test solution (with regard to the correction factor titre) is found by table number of invert sugar (mg) contained in a 100 ml solution. Mass X1 invert sugar concentration was calculated (in g / l) according to the formula:

$$X_1 = m * A * 10/1,000 ,$$

where, m - mass of invert sugar in a 100 cm^3 of the test solution, which is on the table;

A - Fold dilution of the wine or must;

10 - Conversion factor test solution per 1 liter;

1,000 - Coefficient to convert mg of invert sugar in g [2].

Mass concentration of titratable acids was determined in accordance with GOST 14252-73. Determination of titratable acidity based on the direct titration of a metered volume of the wort titrated alkaline solution until neutral (pH 7.0), established with the help of the indicator. When removing carbon dioxide by heating to boil fault added 1 ml of bromothymol blue and titrate with sodium or potassium hydroxide at a concentration of 0.1 mol/l until the blue-green color and immediately add 5 ml of buffer solution. The resulting solution is the reference solution. Then, in another conical flask of 10 ml metered wort, 30 ml of distilled water, heated to boiling, 1 ml of bromothymol blue solution and titrated with 0.1N. solution of sodium or potassium hydroxide at a concentration of 0.1 mol/l of staining appearance, coloring identical reference solution.

RESULTS AND DISCUSSIONS

Given that the pearl wine materials during technological treatments lose their largest margin of surfactants, we investigated the admissibility of enrichment assemblages and pearl wine blends of natural surfactants by adding to them a foam fraction raw pearl wine, which have high concentrations of ASS.

In the industrial laboratory of LP "Nur" assemblages of raw pearl wine Rkatsiteli and Kuldja exposed surface flotation separation with the separation of the foam fraction.

Table 1. Dynamics of foaming properties of pearl wine in the process technological processing's.

Technological operations	Pearl wine materials	
	Rkatsiteli	Kuldja
Untreated assemblage (control)	8.1	7.0
Pasting of assemblage with gelatin 25 mg/l, by betonies 5 g/L	6.7	7.4
Cold treatment (minus 2°C, 3 days)	6.7	6.3
The flotation separation		
Foamy fraction of untreated assemblage	5.6	5.3
The residue of the untreated assemblage	6.4	6.1
Pasting of assemblage with gelatin 25 mg/l, by betonies 5 g/L	7.0	6.5
Cold treatment (minus 2°C, 3 days)	6.1	5.6
The blend: the residue of the assemblage treated bottling of resistant + 5% of foam fractions	7.3	7.6

Assemblages treated according to accepted technological scheme to obtain persistent wine bottling, which also includes a comprehensive pasting and cold treatment. Further fractions assemblages combined. Control data were assemblages of pearl wine without fractional division and processed in the same flow sheet. At every stage technological processing's performed surveillance of change in the foaming capacity.

According to the study (Table 1) during the incremental reduction processing's traced foaming index values, but, nevertheless, the nature of the proposed transformation processing circuitry expressed differently.

As used in industrial processing circuit assemblages pearl wine fining and cold treatment reduces the foaming capacity. In froth flotation separation of a fraction of the value of untreated assemblage foaming

capacity sharply decreases due to the saturation limit of the adsorption layer and the foaming capacity of the untreated assemblage residue increases, but does not reach its original value. This is due to decrease in the concentration of surfactants in the balance due to mass transfer assemblage into the surface layer. Pasting residue assemblage gelatin and betonies causes a slight increase in the foam.

Gelatin fining agents is a natural colloid, and it replaces the natural surfactant pearl wine material, resulting in increased foaming capacity.

When processing of cold foaming capacity assemblages is reduced due to the precipitation of cold unstable protein macromolecules.

A significant increase in foaming capacity assemblage observed when added to process bottling proof assemblage 5% of the volume of its foam assemblage fraction whose value is approximately equal to the initial properties of the foam in the raw sparkling wine.

Next Pearl Rkatsiteli wine stock with an initial foaming capacity was 14.6 with surface flotation separation, a separation of the foam fraction. Indicator foaming capacity was measured in the foam fraction and a remainder of wine stock, which amounted to 8.1 and 6.7 respectively.

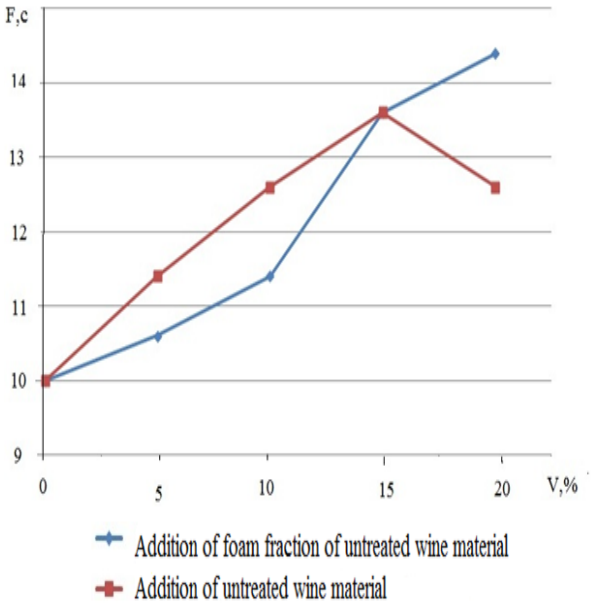

Fig. 1. Dependence foaming properties bottling of resistant blend of pearl wine on the concentration of additives and of foam fraction untreated wine material

Then blend made from wine Rkatsiteli and Kuldja. Next to the bottling of rack, processed blend of the original measure foaming properties was equal to 10.0, was added to the first embodiment of the raw wine materials Rkatsiteli, while the second option - it foamy fraction doses: 5, 10, 15, 20% of the blend.

The prototypes have identified foaming properties indicator F, page and compare it with the initial value of blending foaming (Fig.1).

CONCLUSIONS

The value of the foaming properties increased in all four cases, the addition of a foam fraction of wine materials in the blend. In the case of the introduction of the raw wine material blend traced the high value of the index foaming capacity. For example, adding 15% of the value of the index blending high foaming capacity, and subsequent increase in the volume of the additive observed decrease foaming capacity. This is due to the difference between concentrations of substances which possess surface activity blends in pearly wine material with the addition of natural surfactants.

Thus, the preservation and the concentration of surfactants in the pearly wine materials can be guaranteed by selection of foam fraction wine base surface floatation separation method, and when entering a natural blend of surfactants significantly increases its typical properties [8]. Also according to the data obtained, we can conclude that the improvement in the typical qualities of pearly wine blends can achieve joining them froth fraction wine included in the blend.

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EVOLUTIONS IN THE STAGE OF SCIENTIFIC KNOWLEDGE ON PROJECT MANAGEMENT AND RURAL DEVELOPMENT

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Abstract

The first rural development projects were agrarian reforms, which aimed in particular the prosperity of the peasants in the state land or in the ownership of those who owned more land. At the level of the European Union, about 60% of the population lives in the countryside and covers over 90% of the territory (Study 2014-2020). The main rural development regulations in the European Union are contained in Regulation (EU) 1305/2013 of the European Parliament and of the Council on support for rural development by the European Agricultural Fund for Rural Development (EAFRD). Rural development projects management tools are LEADER +, supporting and encouraging rural economic actors and local action groups (LAGs) through the development and implementation of local development plans. The present paper aims an analysis of the scientific knowledge of project management and rural development, presenting its main characteristics and the evolution of concepts in time, related to the scientific literature in this field.

Key words: *project management, rural development, scientific knowledge, evolution*

INTRODUCTION

If rural development projects included aspects of agrarian reform, they now have as objective aspects of depopulation of the region, loss of cultural heritage, poor economic diversification, poor agricultural competitiveness, underdeveloped infrastructure, protection of biological diversity, tourism, education, international relations, etc.

The concept of a project is defined as "a set of well-defined actions executed over a period of time, with start and end times set for a clear purpose of the work to be done, with its own budget and a specified level of results to be achieved"[11]" as an action that has a beginning and an end and which is undertaken to achieve an objective, in condition of respecting some costs, a calendar, and quality criteria" [8] "a controlled process of implementation of activities and use of resources in order to achieve a goal in a given time" [1] ," the activities to be completed in a definite time "(Belanger, 1995)" the allocation of resources to achieve a predetermined set of objectives, following a planned and organized method" [12] , "a temporary endeavor undertaken with the aim of creating a product or a service" [19].

The concept of project management, also appears in the literature under various definitions "as those procedures, rules, methods, styles and management policies, and other factors that contribute to the smooth running of projects" [12] , " as the coordinating process of a team in the operations planning and management of a defined number of activities dependable and which must be completed on the terms specified [2]," as the application of knowledge, skills, tools and techniques specific for the activities oriented to projects so as to achieve or even exceed the expectations and requirements of those involved in a particular project (stakeholders) [19]," a process that provides contemporary organizations with an only vehicle that will lead them to change, a combination of workforce, technological processes, and technologies for the implementation of projects / programs "[10].

With regard to the concept of rural

development, it is approached in various forms in recent research: rural development considered a strategy that involves expanding the benefits of rural economic growth to those whose future is related to the quest for livelihoods in the country [5], rural development as a management problem involving knowledge to the smallest detail of the realities of rural communities [3] by delegating responsibilities to public authorities that are closest to the citizens, which have the effect of mitigating inequality of income distribution, reduction and even disappearance of unemployment [7] as a novelty is the integrated approach to rural development three forms: exogenous, neo-endogenous and endogenous concept of rural networks [4].

MATERIALS AND METHODS

The research methods of project management refer to: the advantages evaluation that project management offers on the reducing the execution period and the project implementation costs; the way that the management functions are correlated; identifying and reducing the risks; the communication among the project; preparing the staff that is participating in the project's management; innovation in the project management.

The latest research in the field of management addresses to innovations in the management approach. It is worth mentioning: knowledge management, which is based on the relationship between the people and the goals of their work, oriented towards the creation, dissemination and evaluation of the knowledge necessary for the organizational development [15]. In the study of development projects in general and in rural development, analyzes are also included that define the political, economic and social context.

RESULTS AND DISCUSSIONS

The general management is outlined by a multitude of conceptual elements, namely: the definition, the evolution, the typology of the projects as well as the new approaches to project management and rural development.

Concepts on project management

The project represents the amount of activities that help to achieve a common goal and require a significant consumption of resources (human, material, financial, equipment, documentary information and time).

From a time point of view, the implementation of a project involves a moment of beginning and an end time, that is, a period of realization. The initial moment is considered as the one in which the decision is taken to conceive the project, and the final one is the one in which the last activity foreseen by the project is carried out.

It is estimated that project management contributes to better use of resources, develops better customer relationships and contributes to overall company efficiency. Among the disadvantages is a certain trend of violation of internal regulations and incomplete use of the personnel involved in the project.

Table 1. Advantages and disadvantages of using project management

Advantages of using project management	The disadvantages of using project management
A very good control over the use of resources, making it extremely useful in situations when the available resources in an organization are restrained;	A more significant trends of breach of certain components of the internal policy of the company, given the high degree of autonomy for the staff involved in activities based on projects;
Better relationships with clients;	The increasing complexity of the Organization;
Short development times, lower costs, higher quality and higher profit margins;	Incomplete personnel use in the interval of time between the completion of a project and the initiation of the next project.
Increasing the efficiency of the activity as a whole, through its orientation towards results, improving employee morale.	

Source: Introductive guide regarding the project management, http://www.managementul-proiectelor.ro/ghid-introductiv-privind-managementul-proiectelor/ [19]

Project management is the planning, organization and management of tasks, resources and costs to achieve the set objective.

It is necessary to specify the objectives of the project (to clearly define what needs to be done); to be measurable objectives (result can be measured); to be accepted (by those who initiate them); realistic (to be fulfilled); in a specified time (beginning and end) "SMART"[18].

Project management principles

Project management must follow the following principles, regardless of the type of project, independent of the manager's style and personality and the specific method adopted:

-The projects unicity is in the fact that the project has one main objective;

-The project is managed by one person, the coordinator;

-The project's structural decomposition is made depending on the complexity of the project in structural subunits;

-The coordination of activities and resources allocated to the project;

-The evaluation / reassessment should be made from the start and throughout the project runtime for discovering / identifying potential errors from the start-up phase; Project monitoring and evaluation must be done both internally and externally.

Classification of projects is usually done as follows:

-After their location: organizational; local (locality, county, group of counties); regional (the project is of interest to several counties in that geographical region); national; and internationally.

-by field of project objective and activities: agricultural development projects, commercial projects; industrial projects; cultural projects; scientific (research) projects; ecological projects; educational projects; management projects.

Table 2. The structure of the Sapard projects during 2000-2009, "improving the processing and marketing of agricultural and fishery products"

Development region	Number of projects		Minimal value	Maximum value	Medium value	Total value	
	No.	%	Th. euros	Th. euros	Th. euros	Th. euros	%
Northeast	71	*15.6*	22	999	622	44,197	*13.3*
South-East	78	*17.1*	10	400	614	47,898	*14.4*
South Muntenia	70	*15.4*	61	971	831	58,199	*17.5*
South West Oltenia	28	*6.1*	24	424	839	23,509	*7.1*
West	45	*9.9*	75	1,653	996	44,859	*13.5*
Northwest	55	*12.1*	61	1,273	524	28,852	*8.7*
Center	81	*17.8*	13	2,987	722	58,560	*17.7*
Bucharest-Ilfov	28	*6.1*	25	1,909	915	25,635	*7.7*
Total	456	*100.0*	X	x	x	331,709	*100.0*

Source: AFIR, Beneficiaries list of SAPARD [21, 22]

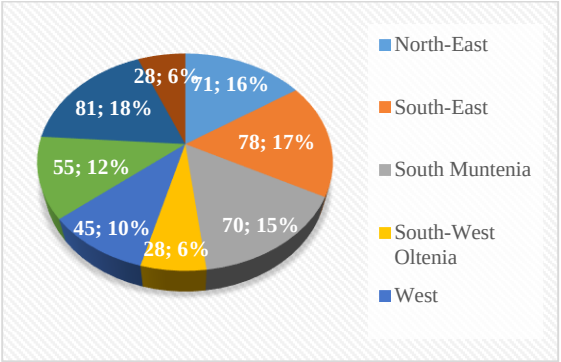

Fig. 1. The number of implemented projects of Sapard projects during the period 2000-2009

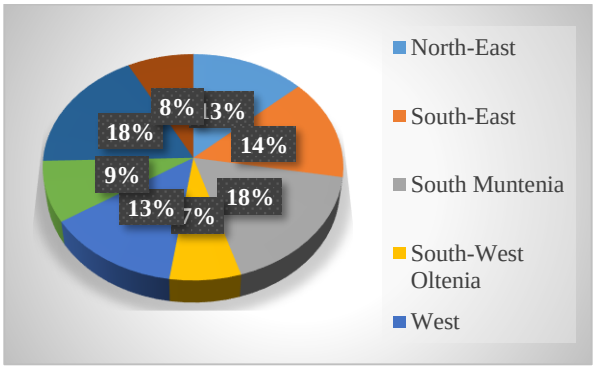

Fig. 2. The share of the developments regions in the total value allotted in the Sapard projects, period 2000-2009.

Examples of projects under the Sapard Program (2000-2009) are presented in the structure by development regions, number of prortelects, minimum, maximum and average value of a project and its value and structure by development regions (Table 2).

Specific features of management functions in project management

Taking into account the fact that a manager leads other people, who are in a well-defined and dimensioned organizational formula (organization, compartment, etc.), he/she has to make decisions and initiate actions that allow the achievement of the objectives in terms of effectiveness and efficiency. In other words, the manager must: provide, organize, coordinate, train, and control.

Henry Fayol initiated the activities group of manager by functions since 1916 and defined the management, named by him *administration* as follows: "to manage means to forecast, organize, command, coordinate and control" [6].

Managerial Function of Forecast

The forecast is the first managerial function, triggering the managerial process. Henri Fayol believes that the prediction is the most important function of a managerial process, the content of which depends on the way in which the other functions are exercised: organization, coordination, training, control and evaluation.

The Forecasting function includes decisions that determine the objectives of the organization and its structural and procedural components, the modalities of realization, the resources to be committed and the deadlines for achieving the established objectives.

The exercise of the function consists of three activities: prognosis; planning - developing global and partial strategies and policies; programming - time and space detail of policies.

Regarding the change in the forecast area, stands intensification, diversification and amplification through proactive management: strategies and realistic policy that leverages information marketing research and prognosis;

Activity planning and development department; A statistical planning tool (decision-making, creativity, extrapolation, etc.); Restricting environmental, national and international influences).

For project management, the key elements of planning are: how to allocate activities, quality, cost, budget, human resources, risks and communication mechanisms [9]. It is necessary to know the risks and their likelihood of realization for the entire duration of the project execution.

Organization Managerial Function

Organization is the managerial function that refers to the delimitation of work processes in their grouping on compartments and posts and the assignment of tasks to all staff in order to achieve the objectives.

Organizing activity is apparent through the whole organization (operation of the system and its subsystems) and procedural and structural organization of the main components of the organization (activities or compartments).

A cause of managerial malfunctions can be constituted by organization by: the non-synchronization of skills; Organizational culture insufficiently oriented towards promoting the new; The need to take multidimensional competence into account when engaging; The expansion of work by inappropriate sizing of posts; Modernizing managerial organization behavior by designing / redesigning and maintaining the operation of its management system and subsystems.

Two elements define this function: organization of the management (posts, attributions, compartment, control area and delegation of authority) and division into subdivisions of the organization [16].

Managerial Coordinating Function

The function of Coordination is a continuation of the organizational function and consists in harmonizing the decisions and actions of subordinates and organizational subdivisions of the organization in order to achieve the objectives. Communication is the basis of Coordination, being defined by processes of transmission of informational

messages on downstream or downstream flows between manager and subordinates.

Coordination elements, namely sizing, streamlining organizational goals between departments and between managers and performers on: diversity of human reactions that require a permanent and operational feedback; volume, complexity and diversity of objectives; differences in professional and managerial training of people; attitude towards change both of managers and subordinates of different general culture level.

Communication is considered to be the driving force of managerial processes and is a prerequisite for a healthy motivational and organizational climate to achieve goals.

The diversity of communications is generated by the multitude of kinds of communication between people. Types of communications can be classified according to several criteria: communication channels, transmission direction, content of communications, etc.

Depending on the communication channel, it is distinguished: formal communications, stipulated by internal provisions, normative acts, etc., which are necessary for the development of the work processes, and informal communications, spontaneously established between posts and compartments and found in informal information.

Following the direction of transmission of the message the communications can be: vertical descendants, which are found between managers and subordinates and consist of instructions, decisions, regulations; vertical ascendants, between subordinates and managers; horizontal, established between posts and compartments located on the same hierarchical level; oblique or functional communications between posts and compartments on different hierarchical levels, without being hierarchical authority relationships between them.

After the contents of these communications can be: general or assembly; motivational, established between managers and subordinates regarding the motivational aspects of the work processes; operators, which consist of some explanations, instructions, etc.

By the means of transmission, communications can be: verbal and non-verbal in over 70% of the messages being sent and received in a conversation.

As a trend, there is a proliferation of multilateral coordination on the background of the proliferation of participatory management styles that enable managerial executives to set and accomplish goals and to make decision-making processes.

Managerial Training Function (Command-Motivation)

Training function (Control -Training) [14], consists of decisions and actions that determine employee participation in setting and achieving goals and taking into account the motivating factors. Motivation refers to the correlation of material and moral-spiritual rewards / sanctions with the actual results obtained from achieving the objectives. Motivation can be found in the following ways: positive motivation, when priorities are material rewards and spiritual moral; negative motivation, when for short period of time, penalties are priority.

The training function shows some failures that are caused by the promotion some populist criteria in granting materials rewards; lack of transparency in the results promotion; non-payment of wages on time; the unsettled of generating social conflicts state.

For the staff training in the guarantee of achieving the objectives are required: a flexible system of material cointerest, motivation to be based on a profound analysis and continuous of employees [17], depending on the degree of realization of objectives and individual access to goal setting by promoting a participatory management.

Managerial Function of Control-Evaluation

Control-evaluation function [3], involves evaluating the results, comparing them with the objectives, identifying the causes of deviations negative and positive and adoption of decision both corrective or preventive.

In order to achieve the objectives of the projects, it is necessary to specify how these functions take place over time. Thus, the predictive function - has a higher intensity at

the beginning of the period (policy development, programs, plans), the organizational function - follows, the forecasting process, with a high level of intensity drawing up and approving the plan; the coordination function has a different cyclical evolution depending on the preparation of the organizational conditions for their achievement; the engagement function has a high level throughout the project runtime but has a maximum in times of material rewards; the control-evaluation function is marked by the intensity increase at the beginning and the end of the planning period but also throughout the project has to be maintained at a high level.

In the follow-up of the project functions, the project manager developed a program that evaluates: the realization of the planning, the risk of non-framing in time, the GANTT graphic tracking, the automatic elaboration of "optimistic" shortening of the deadlines by the "PERT" "Acquired value".

Implementation of Expert systems involves: evaluating and preparing the project manager for project management; entering data on the duration and cost of project activities in different variants; developing time variants where the optimistic version is operational; generating a dialogue on activities history.[20]

The variety of project management application fields has led to the development of specific manuals on how to apply them in these areas: technical, economic and social.

CONCLUSIONS

Development projects are complex studies required by the very needs of solving perspective issues that are elaborated in a certain political, economic and social context. *The elements that are composing general management* within specific concepts.

From the multitude of conceptual elements defining the general management, we must retain terms such as: definition, evolution, typology of projects as well as new structural approaches specific to project management and rural development.

The project thus represents a sum of activities that lead to a common goal and requires a significant consumption of resources (human, material, financial, equipment, documentary information and time). Project management tracks planning, organizing and managing tasks, resources, and costs to achieve the goal set.

At the same time the principles of project management will have to respect principles regarding:

The uniqueness of the objective consisting in the fact that the project has a single main objective;

Managing the project with reference to its leadership, which is done by a single manager, the coordinator;

The structural decomposition of the project can be made depending on the complexity of the project in structural subunits;

A specific form of coordination of the activities and resources allocated to the project;

The evaluation / reassessment that needs to be done from the beginning and throughout the project runtime for the discovery that can identify possible errors from the start-up phase;

Monitoring and evaluating the project must be done permanently both internally and externally.

Regarding the knowledge of the types of projects it can be shown that they are structured according to the location, the scope of their objective and their activity.

Specific particularities of management functions in project management are defined and designed by the very management functions (forecast, organization, coordination, training and control).

For project management, key elements in planning are: how to allocate activities, costs, quality, human resources, budget, risks and communication mechanisms. Regarding the risks that may arise throughout the execution of the project, it is necessary to know them, but also the probability of realization.

With particular reference to the organizational function, it can be shown that two elements define this function:

organization of the management (posts, duties, compartment, control area and delegation of authority) and division into subdivisions of the organization.

As a trend, there is a proliferation of multilateral coordination on the background of the proliferation of participatory management styles that enable managerial executives to set and accomplish goals and to make decision-making processes.

In achieving the objectives of the projects, it is necessary to specify how these functions take place over time. Thus, the forecast function - has a higher intensity at the beginning of the period (policy development, programs, plans), the organizational function assumes a high level of intensity in the elaboration and approval of the plan; The coordination function having a different cyclical evolution depending on the preparation of the organizational conditions for their achievement; The training function has a high level throughout the project runtime but has a maximum in times of material rewards; The control-evaluation function, which is marked by the intensity amplification at the beginning and the end of the planning period, but also throughout the entire project period, which must be maintained at a high level.

The state of scientific knowledge regarding the project management of rural development.

Rural development project management is a process of coordinating a team, individuals and institutions in the planning and management of a defined number of inter-related activities that provide organizations with a tool for change.

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POSSIBLE ASSESSMENT OF SALT TOLERANCE IN *OCIMUM BASILICUM* BY CHLOROPHYLL FLUORESCENCE

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Abstract

The present study was carried out to evaluate the impact of NaCl on chlorophyll florescence in three ecotypes of sweet "basil" (Ocimum basilicum L.) i.e., Multan, Khanewal and Rajanpur. Four weeks old seedlings were treated by different concentrations of NaCl (0, 50, 100, 150, 200 mM). Results showed that the increasing salinity stress had a negative impact on QY (Quantum yield), NPQ (Non photochemical quenching) and OJIP in three ecotypes of Ocimum basilicum L. From the findings, it is obvious that salt stress had a slight inhibitory effect in the first week of salt treatment. Under saline conditions as compared to non saline conditions dark adopted leaves of Rajan pur ecotype have reduced fv/fm ratio in third week of salt stress but decreased with increasing levels of salt stress in other two ecotypes. Therefore, analysis of the results showed that sweet basil might tolerate a level of salt stress up to 150 mM of NaCl and chlorophyll fluorescence can be used as a criterion for assessing salt tolerance in sweet basil as well as helpful to screen which ecotype might tolerate better the salinity stress. Our findings suggested that basil can be cultivated on salt effected soils up to moderate level that can be of potential importance in Ocimum basilicum production.

Key words**:** *salt tolerance, chlorophyll fluorescence, ocimum basilicum, medicinal plant*

INTRODUCTION

High concentration of salts in soil not only affects plant growth but also photosynthesis, they are among the primary processes of plant life which are affected by salinity stress. Under saline conditions photosynthesis is particularly reduced which results in reduced growth and productivity. Salinity induces many adverse effects on the photosynthesis of plants and stomatal conductance with decrease crop productivity and ultimately death of plants [1]. Photosynthesis is an important parameter used to monitor plant response to abiotic stress [2] [3]. When plants exposed to salt stress for a long time and salt continues to accumulate in the leaves and this critical concentration of salt in the leaves affects the photosynthesis due to disturbance of structure and functions of photochemical apparatus and photochemical reactions. Reduction of Rubisco i.e. ribulose-1.5-bisphosphate carboxylase/oxygenase is closely associated with damage of photosynthetic apparatus [4] [5]. Hence, salinity and water stress negatively alter leaf water relations and osmotic balance which ultimately disturbed the photosynthesis. The analysis of chlorophyll a fluorescence (CF) is one of the widest spread method in photosynthetic research, mainly originates from PSII. It is fast, easy and noninvasive tool to measure the plant's photosynthetic performance and used by plant physiologists and ecophysiologists. Chlorophyll fluorescence is now a very powerful, unique nonintrusive mean of obtaining quickly semi quantitative information on photosynthesis, could be used for screening of salt tolerance of crops in the field and in the laboratory. The functioning of the Photo-system II is directly affected by salt stress; salt injury has been reported in various plants [6][7]. Thus chlorophyll a fluorescence kinetics is considered as informative tool in field and laboratory for studying the effects of abiotic stress on photosynthesis [8][9]. *Ocimum basilicum* is being utilized as a source of essential oils mainly in industries, perfumery, dental, oral products and traditional ritual. As a part of the tradition and religious rituals, basil

needs more attention for the furtherance of its cultivation on a commercial scale as compared to other medicinally important plants. The aim of this study is to promote the cultivation of basil plants as well as utilization of saline lands which are unproductive for a number of field crops and reduce the average production of major crops greater than 50% [10].

MATERIALS AND METHODS

An experiment was conducted in glasshouse of Botanical garden of Bahauddin Zakariya University, Multan, Pakistan (30˚11N and 71˚28E). The average photoperiod 8 h and day/night temperature 24 ± 8˚C and 16± 4˚C during July-september 2013. The humidity ranged from 34.5 to 46.5 percent. Seeds of three ecotypes of *Ocimum basilicum* L. were collected from three different localities i.e. Multan, Khanewal and Rajan Pur districts of Punjab, Pakistan.

Sixty pots were used in the experiment filled with river sand and thoroughly washed with tap water. There were five different regimes of salinity stress (0, 50, 100, 150 and 200 mM) of NaCl and design of experiment was randomized complete block with four replicates. Sterilization of basil seeds were done by 5 % sodium hypochlorite solution for 5 minutes and distilled water was used to wash. Eight days after germination eight seedlings of equal size at equidistance in each pot were selected. Half strength Hoagland nutrient solution was applied to all the pots for normal growth of the plants for four weeks. Treatments were started after four weeks of sowing. Salinity concentration was increased stepwise in aliquots of 50 mM to avoid the salt shock [11].

The treatment solution of NaCl salt was given to all pots every week and to maintain the salinity levels in sand. After one month's growth, plants were subjected to measured chlorophyll a fluorescence in green, healthy and completely mature leaves using a small handy fluormeter (Photon System Instrument, FluorPEN FP 100, and Czech Republic). Measurements were taken on the selected leaves which were dark adapted for 20 min, a period of time sufficient for all photo-system II reaction centers to become open. Immediately after the dark adaptation, the leaves were exposed to light pulse with intensity of 2700 µmol m-2 s-1, with a wavelength of 650 nm for 5 s. The fluorescence transients were recorded from 10 µs to 5 s at 12 bit resolution [12]. The FlourPen software (PSI, CZ) was used to load the full fluorescence transients.

Statistical analysis: The collected data for chlorophyll fluorescence were analyzed by using COSTAT computer package (Cohort software, Berkeley, California) and differences between the mean values tested by following Snedecor and Cochran (1980)[13].

RESULTS AND DISCUSSIONS

From the results it was concluded that all NaCl treatments had a negative effect on the chlorophyll fluorescence such as QY (Quantum yield), NPQ (Non photochemical quenching) and OJIP in three ecotypes of *Ocimum basilicum* L. QY was decreased in plant parts such as leaves with increase salinity, whereas it was significantly ($P \leq 0.001$) reduced at high level of salt stress (200 mM NaCl) as compared to control (Table 1). Varying levels of salt application affected negatively on maximum efficiency of PSII Photochemistry (Fv/Fm) measured in the dark adapted leaves of three ecotypes under studied. Thus, in the absence of NaCl, Fv/Fm ratio was in the range of 0.730- 0.790 in all three ecotypes of sweet basil (Fig. 1-3).

Table 1. Analysis of variance of data for QY (F_V/F_M) of three ecotypes of *Ocimum basilicum* when four weeks old plants were subjected to varying levels of NaCl salinity stress for further one, two and three weeks grown in sand culture in full strength Hoagland's nutrient solution.

SOV	df	Light QY after one week of salt stress	Light QY after two weeks of salt stress	Light QY after three weeks of salt stress
Ecotypes	2	0.000***	0.000***	0.0716 ^{ns}
Salt	4	0.0371*	0.000***	0.000***
Ecotypes x salt	8	0.0018**	0.0128*	0.9293 ^{ns}
Error	45	4.1393	3.8647	0.010418
Total	59			

*, **, ***, significant at 0.05, 0.01, and 0.001 probability levels respectively; ns = non-significant

Moreover, light and dark adopted QY concentrations was measured in first, second and third week of salt stress. Results showed that in first week of salt stress of NaCl there was no significant difference at all levels of NaCl salinity and no more difference between three ecotypes but in second and third week of salt stress there was significant difference between three ecotypes and all levels of salinity stress.

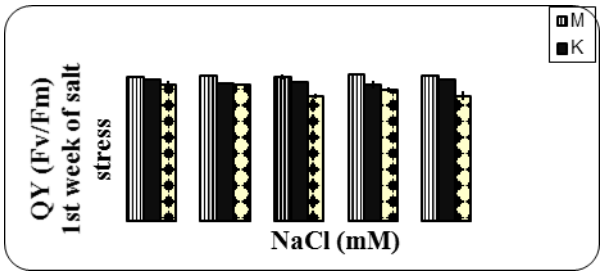

Fig. 1. QY (Fv/Fm) of three ecotypes of *Ocimum basilicum* when four weeks old plants were subjected to varying levels of NaCl salinity stress for further one week grown in sand culture in full strength Hoagland's nutrient solution.

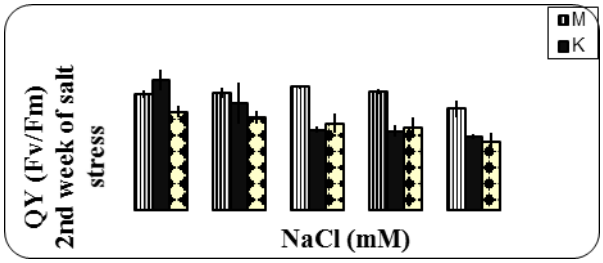

Fig. 2. QY (Fv/Fm) of three ecotypes of *Ocimum basilicum* when four weeks old plants were subjected to varying levels of NaCl salinity stress for further two weeks grown in sand culture in full strength Hoagland's nutrient solution.

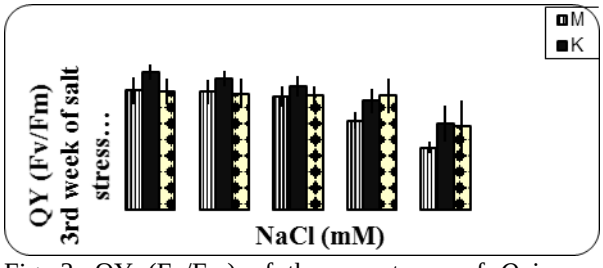

Fig. 3. QY (Fv/Fm) of three ecotypes of *Ocimum basilicum* when four weeks old plants were subjected to varying levels of NaCl salinity stress for further three weeks grown in sand culture in full strength Hoagland's nutrient solution.

The most pronounced effects of salt stress were observed at high level of salt stress 200mM NaCl and reduction was clearer in M. ecotype of sweet basil. However, at all levels of salt stress QY (Fv/Fm) decreased significantly ($P \leq 0.001$) (Table 2; Fig. 4-6).

Table 2. Analysis of variance of data for dark QY (F_V/F_M) of three ecotypes of *Ocimum basilicum* when four weeks old plants were subjected to varying levels of NaCl salinity stress for further one, two and three weeks grown in sand culture in full strength Hoagland's nutrient solution.

SOV	df	Dark QY after one week of salt stress	Dark QY after two weeks of salt stress	Dark QY after three weeks of salt stress
Ecotypes	2	0.3882 ^{ns}	0.000***	0.000***
Salt	4	0.0064**	0.0076**	0.0041**
Ecotypes x salt	8	0.9832 ^{ns}	0.0986 ^{ns}	0.5365 ^{ns}
Error	45	0.01903	0.007576	0.004986
Total	59			

, *, significant at 0.01, and 0.001 probability levels respectively; ns = non-significant

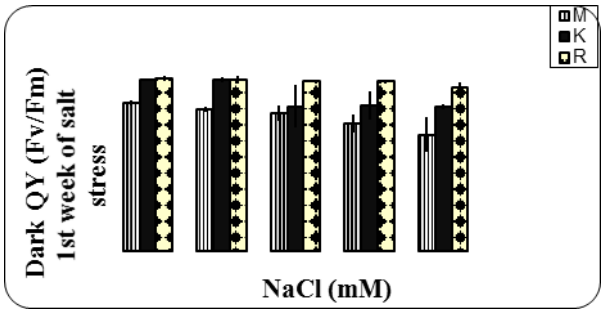

Fig. 4. Dark QY (Fv/Fm) of three ecotypes of *Ocimum basilicum* when four weeks old plants were subjected to varying levels of NaCl salinity stress for further one week grown in sand culture in full strength Hoagland's nutrient solution.

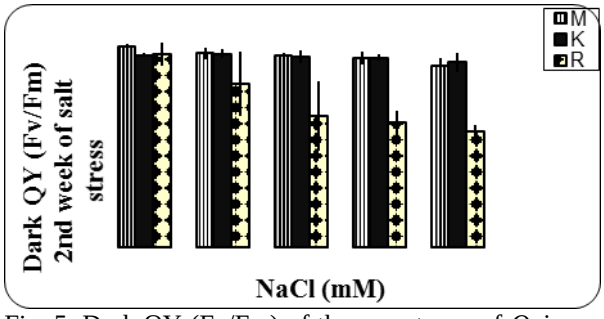

Fig. 5. Dark QY (Fv/Fm) of three ecotypes of *Ocimum basilicum* when four weeks old plants were subjected to varying levels of NaCl salinity stress for further two weeks grown in sand culture in full strength Hoagland's nutrient solution.

The chlorophyll fluorescence yield at three phases i.e. J, I and P were same in all levels of salt treated plants and there was no significant difference between three ecotypes of *O. basilicum.*

Absorption flux of photons per reaction center (ABS/RC) and maximum trapping rate by

which an excitation is trapped per active PSII reaction center (TR_0 /RC) were slightly decreased in R. ecotype that treated with different levels of NaCl salinity as compared to K. and M. ecotypes.

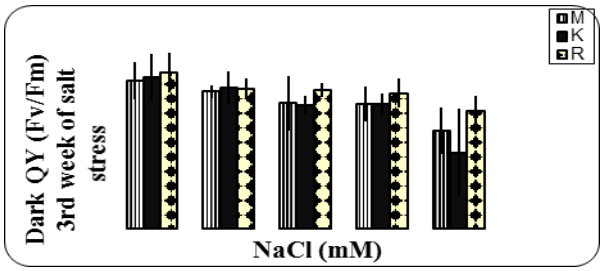

Fig. 6. Dark QY (Fv/Fm) of three ecotypes of *Ocimum basilicum* when four weeks old plants were subjected to varying levels of NaCl salinity stress for further three weeks grown in sand culture in full strength Hoagland's nutrient solution.

Table 3. Analysis of variance of data of selected parameters obtained from JIP test of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl salinity stress for one week

SOV	Ecotypes	Salt	Ecotypes x salt	Error	Total
Df	2	4	8	45	59
Fo	0.1095 ns	0.6323 ns	0.1044 ns	2879	
Fj	0.3718 ns	0.5281 ns	0.1301 ns	35065	
Fi	0.000***	0.3442 ns	0.0843 ns	66369	
Fp	0.000***	0.1179 ns	0.0756 ns	85190	
ABS/RC	0.2151 ns	0.7865 ns	0.8867 ns	0.0339	
TR0/RC	0.000***	0.0190*	0.5929 ns	0.01830	
ET0/RC	0.0767 ns	0.0032**	0.4968 ns	0.03158	
DI0/RC	0.000***	0.0436*	0.4335 ns	0.00483	
Fv/Fm	0.000***	0.004**	0.0037 **	8.5309	

*, **, ***, significant at 0.05, 0.01, and 0.001 probability level; ns = non-significant

Therefore, ET0/RC (electron transport per active Photo-system II reaction center) concentration was decreased in R. ecotype at high level of salt stress 200 mM NaCl and DI0/RC (effective dissipated flux of untrapped excitations per active PSII RC) in K. and M ecotypes were same at all levels of NaCl but increased in R. ecotype with increasing levels of salt stress.

There was no marginal or significant decreased in quantum efficiencies of PSII like TR0/ABS (=FV/FM), ET0/ABS, ET0/TR in three ecotypes of sweet basil when compared to 0 mM NaCl salinity (Table 3,4; Fig. 7-1).

Table 4. Analysis of variance of data of selected parameters obtained from JIP test of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl salinity stress for three weeks

SOV	Ecotypes	Salt	Ecotypes x salt	Error	Total
Df	2	4	8	45	59
Fo	0.0000***	0.3616 ns	0.5578 ns	213726	
Fj	0.0000 ***	0.5376 ns	0.7043 ns	186922	
Fi	0.0000 ***	0.5648 ns	0.9383 ns	272363	
Fp	0.0000 ***	0.0506 ns	0.9592 ns	300797	
ABS/RC	0.0009***	0.6048 ns	0.3282 ns	0.06169	
TR0/RC	0.0062**	0.5352 ns	0.2463 ns	0.026543	
ET0/RC	0.0000***	0.1894 ns	0.1512 ns	0.080836	
DI0/RC	0.0000***	0.0065**	0.0538 ns	0.007182	
Fv/Fm	0.5852 ns	0.0252*	0.4108 ns	0.001355	

*, **, ***, significant at 0.05, 0.01, and 0.001 probability level; ns = non-significant

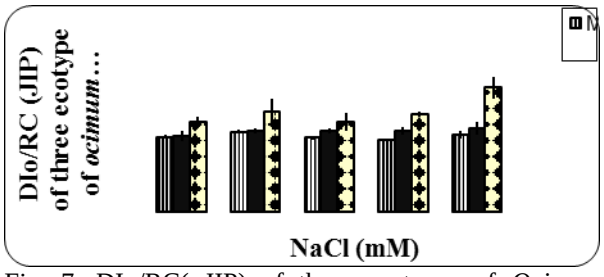

Fig. 7. DIo/RC(JIP) of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl stress for three weeks.

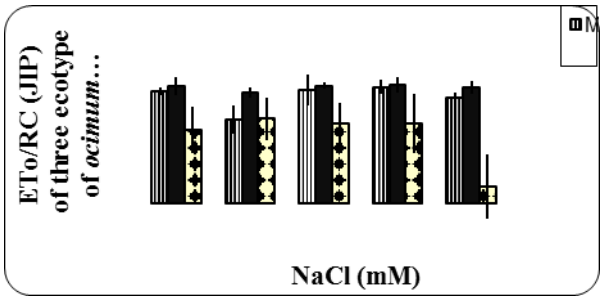

Fig. 8. ETo/RC(JIP) of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl stress for three weeks.

The chlorophyll fluorescence was used to detect changes induced by salinity in the maximum quantum yield of PSII and can estimate photosynthetic efficiency of leaf under various conditions of stress. It has been shown that these are to be reliable indicators of stress.

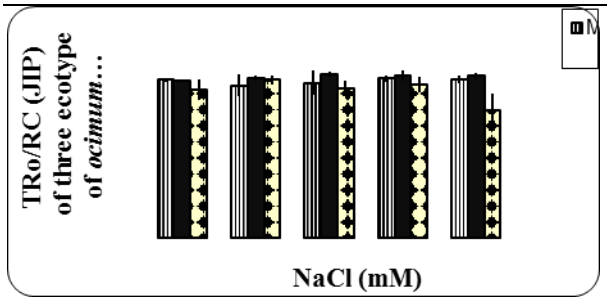

Fig. 9. TRo/RC(JIP) of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl stress for three weeks.

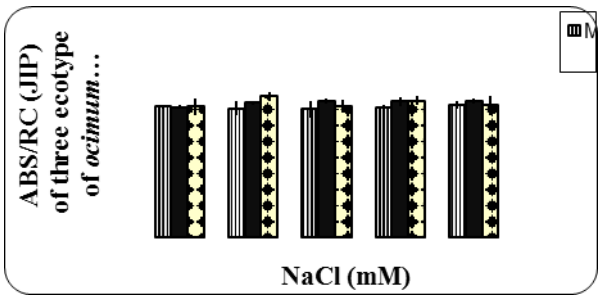

Fig. 10. ABS/RC(JIP) of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl stress for one week.

Non photochemical quenching coefficient was reduced as salt levels increased in all three ecotypes of basil plants (Table. 5, 6; Fig. 11).

Table 5. Analysis of variance of data of selected parameters obtained from NPQ test of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl salinity stress for three weeks

SOV	Ecotypes	Salt	Ecotypes x salt	Error	Total
Df	2	4	8	45	59
NPQ_L1	0.2941 ns	0.1984 ns	0.0293*	0.03349	
NPQ_L2	0.9954 ns	0.5023 ns	0.1254 ns	0.046615	
NPQ_L3	0.6989 ns	0.3978 ns	0.2479 ns	0.06633	
NPQ_L4	0.3454 ns	0.3290 ns	0.2145 ns	0.08225	
NPQ_Lss	0.1881 ns	0.3143 ns	0.2555 ns	0.086541	
NPQ_D1	0.1243 ns	0.7481 ns	0.4687 ns	0.00827	
NPQ_D2	0.0012**	0.0869 ns	0.6174 ns	0.004331	
NPQ_D3	0.0418*	0.1993 ns	0.5198 ns	0.004240	

*, **, ***, significant at 0.05, 0.01, and 0.001 probability level; ns = non-significant

The photochemical quenching energy dissipation is the main process which protects the photosynthetic machinery from photo damage. Energy dissipation by photo damage due to salinity causes reduction in the relative quantum yield of PSII creates and maintains balance between and carbon metabolism and photosynthetic electron transport [14].

Table 6. Analysis of variance of data of selected parameters obtained from NPQ_Fm test of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl salinity stress for three weeks

SOV	Ecotypes	Salt	Ecotypes x salt	Error	Total
Df	2	4	8	45	59
Fm_L1	0.0005***	0.0039**	0.4763 ns	196231	
Fm_L2	0.0006 ***	0.0057 **	0.2806 ns	783427	
Fm_L3	0.0004***	0.0120*	0.2457 ns	488245	
Fm_L4	0.0002***	0.0123*	0.2201 ns	377020	
Fm_Lss	0.0000 ***	0.0065 **	0.2159 ns	301186	
Fm_D1	0.0009***	0.0045 **	0.2553 ns	868836	
Fm_D2	0.0055***	0.0139 *	0.2671 ns	118243	
Fm_D3	0.0017**	0.0109 *	0.3442 ns	145854	

*, **, ***, significant at 0.05, 0.01, and 0.001 probability level; ns = non-significant

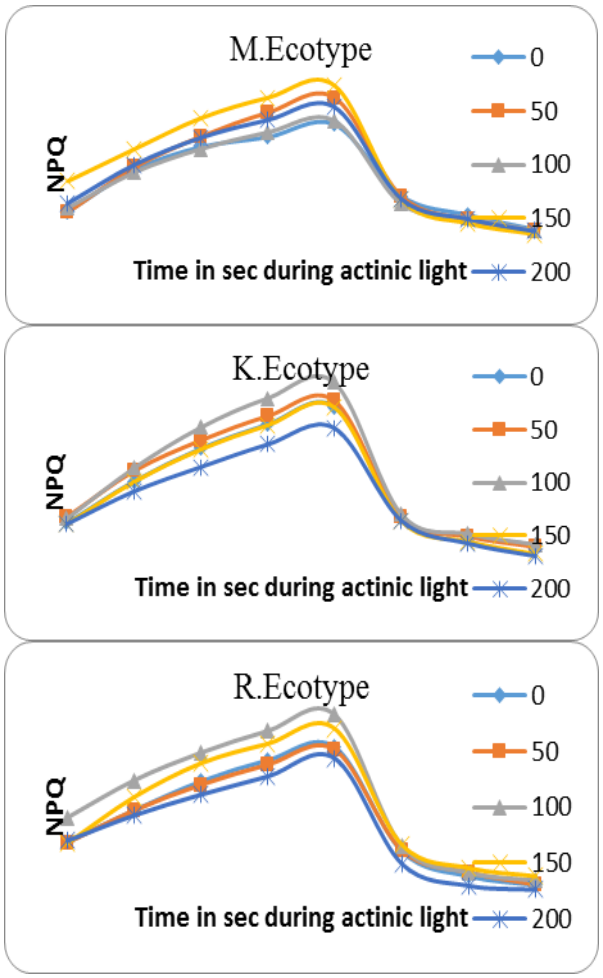

Fig. 11. NPQ Curves of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl stress for three weeks.

From the results it was concluded that second and third week of salt stress had significant

effect on three ecotypes of sweet basil at all levels of salt stress as compared to control. It has been concluded from the studies that salinity alone had no significant on PS II photochemistry at relatively low light but effects of both salt stress and high light induced photo damage to PSII (Fig. 12).

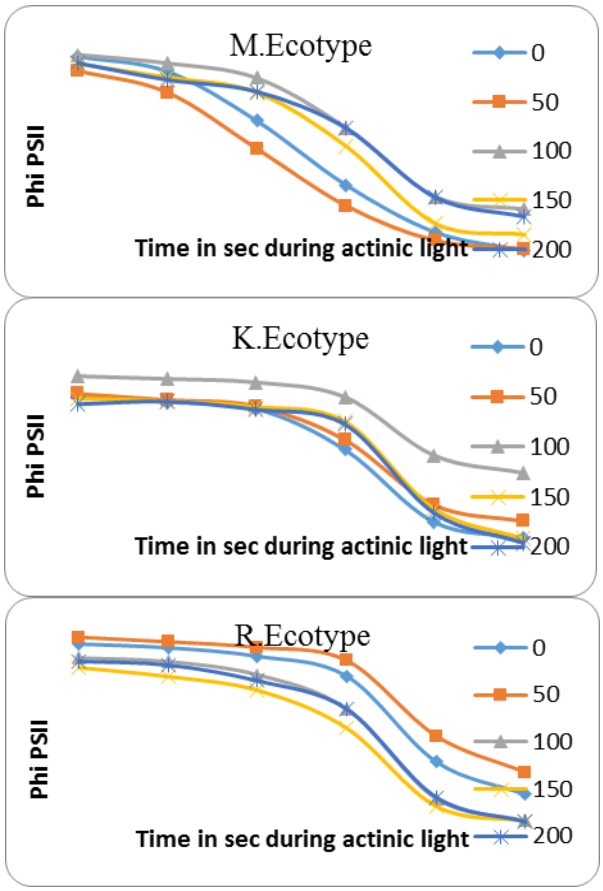

Fig. 12. Phi PSII of three ecotypes of *Ocimum basilicum* L. when four weeks old plants were subjected to varying levels of NaCl stress for three weeks.

When leaves of three ecotypes of basil plants were exposed to different levels of salinity stress, it had no effects on quantum yield (Fv/Fm) of dark adopted leaves. Different plant species have almost constant Fv/Fm ratio ($0.80 \leq Fv/Fm \leq 0.86$) measured under non stressed conditions ([15]). But Fv/Fm ratio in different plant species decrease up to these values 0.588 ± 0.019 under severe salinity stress [16]. Furthermore, slight change in Fv/Fm ratio at high salt levels suggesting that only small reductions in photosynthesis occurred at a high level of salinity stress and causes inhibition in the ability of PSII to reduce Q_A which is primary acceptor of PSII. On the other hand, it is observed that lower Fv/Fm in salt stress conditions as compared to control, will regenerate RUBP and this regeneration need some electron translocation from PSII to electron acceptor, may be disturbed by salt stress [17].

In our findings, slight change in Fv/Fm was appeared in first week of salt stress and at high level of NaCl salinity in three ecotypes of basil plants. There might be two reasons for this small change one is related to damage of chlorophyll and other is ionic imbalance under high salinity ([18][19]). It was reported in other study that negative effects on growth related to decrease in PSII activity and chlorophyll contents [20].

Quantum yield of photosystem II (ΦPSII) decreased by increasing salt concentration and ΦPSII reflected electron transport rate was highest at low salt level of NaCl Therefore, Quantum yield of photo-system II was markedly reduced in R. ecotype as compared to other two ecotypes at high level of salinity stress. The selected JIP-test parameters were listed in Tables 3 and 4. The results of these parameters have contributed to a better understanding of the responses of basil plants to salinity stress. It was concluded that salinity had inhibitory effects on the photochemical activity of plants which results in increase number of closed PSII reaction centers and hinder the participation of large number of closed PSII reaction centers in electron transport [21]. Present results in chlorophyll fluorescence confirmed that photosynthetic activity was more inhibited under high salinity than that under low and moderate salt stress.

CONCLUSIONS

The above mentioned parameters of chlorophyll fluorescence are appropriate criteria for the diagnosis of salt stress in plants. Quantum yield of photo-system II and Fv/Fm ratio (maximum photochemical efficiency of PS II) of three ecotypes of *Ocimum basilicum* L. was reduced at high level of salt stress and this could be a reliable indicator of salt stress in all plant species.

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SURVEY ASSESSMENT OF INDIGENOUS KNOWLEDGE FOR SEEDS CONSUMPTION OF SWEET BASIL AND PSYLLIUM BY LOCAL COMMUNITY IN SOUTHERN PUNJAB, PAKISTAN

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Abstract

The assessment of indigenous knowledge for seeds consumption of sweet basil and psyllium as a source of fiber by local community was carried out in different parts of southern Punjab, Pakistan. A structured questionnaire was prepared with close ended questions. Data collected were subjected to the descriptive statistic like percentage, frequency, bar and pie chart. According to the findings of surveyed analysis we concluded that 77 % people under surveyed attained the traditional knowledge about sweet basil and psyllium from family members whereas results showed that most of the people (87.50 %) who used these plants as a source of fiber were above age of 40. The study further revealed that people of local community consumed the seeds of selected plants only based on traditional knowledge and reluctant to used them more frequently. Most of the surveyed people (87.5%) used Psyllium as a source of fibers to cure the digestive problems whereas sweet basil seeds used by the people (44 %) only for seasonal recreational purposes without knowing its specific worth of efficacy. On the other hand, majority of respondent preferred to use whole grains as compared to refined grains. From these results we found clear idea for novel food product preparations in future study from seeds of selected medicinal plants in according to the needs of consumers.

Key words**:** *indigenous knowledge, sweet basil, psyllium, respondents, seeds*

INTRODUCTION

Indigenous knowledge is specific to given culture or society which is based on experiences, often tested over centuries of use [1]. From the past literature we concluded, the local communities of different regions of Pakistan have centuries old knowledge about traditional uses of the selected medicinal plants (sweet basil and Psyllium) occurring in their areas. The use of plants as medicine is an ancient practice and indigenous knowledge of plants has been transferred from generation to generation. The uses of medicinal plants vary in different parts of the country due to indigenous knowledge and method of utilization. Moreover, rich diversity of medicinal plants is an important source of livelihood for majority of the rural and mountainous communities because of low cost treatment for various common diseases. Among the plants known for medicinal value, the plants of genus *Ocimum* are very important for their therapeutic potentials. Because of its popularity basil is often referred to as King of herbs, being widely utilized due to its economic, nutritional, industrial and medicinal properties. It is high value economical plant. Basil is an aromatic herb used extensively, from ancient times, to add distinctive aroma and flavor to food. The leaves can be used fresh or dried and the essential oils extracted from fresh leaves and flowers can be used as aroma additives in food, pharmaceuticals, and cosmetics [2]. The second plant of our study is *Plantago ovata* L. locally known as Isabgol belonging to the family Plantaginaceae is a stem less Ayurvedic herb, used in health care for many centuries in South Asia, and it is now widely used for its medicinal properties all over the world. Seed husk (rosy-white membranous covering of the seed) mainly given as a safe laxative, particularly beneficial in habitual constipation, and for chronic diarrhea and dysentery. It is also used in lowering blood cholesterol level, ice cream making and cosmetics [3]. The selected medicinal plants are traditionally used by the local communities for different purposes. The purpose of the study was to assess the

knowledge of the surveyed people in according to selected medicinal plants as a non conventional source of fiber in comparison of both selected plants.

MATERIALS AND METHODS

For the purpose of this study, people were randomly surveyed according to the requirement of current research work. Sites were chosen on the basis of easy access to the location and the availability of people. Surveys were conducted with people who live in Pakistan. Survey questionnaire were distributed through mailed on the months of June and July 2016 while oral interviews complimented the questionnaire.

Survey questionnaire contained closed questions which can be answered with a yes or no, multiple choice, or short answer [4]. They usually last for no more than a minute and do not require extended responses from participants. For the surveys, ten questions were asked and the age and gender were recorded in order to classify and understand the demography of people who use medicinal plants (See Appendix I). The survey information was then transcribed into a worksheet on Microsoft Excel.

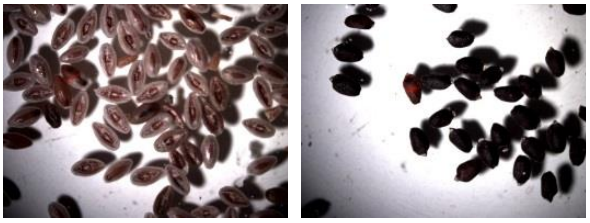
RESULTS AND DISCUSSIONS

While evaluating results of present study' opinion and feedback of consumers really matters. Ideal way to collect this feedback is to deploy in a best suited places and make novel products from these seeds to distribute in that places so they can practically experience how new food product effects their everyday life, how much they can get energy and fiber supplement from such food products, what level of ease or difficulty they face while consuming a novel fibrous food, and overall how it can effect human activities.

The therapeutic purposes of medicinal plants are as old as human civilization. According to literature [5] about 20 % of the whole plants are successfully utilized for curing the ailments in human beings.

Table 1. Taxonomy of selected medicinal plants in order to find relationship between both species

Kingdom PLANTAE – Plants	**Kingdom PLANTAE**
Sub-kingdom TRACHEOBIONTA– Vascular plants	**Sub-Kingdom** VIRIDIPLANTAE
Division MAGNOLIOPHYTA – Flowering plants	**Division** TRACHEOPHYTA
Class MAGNOLIOPSIDA – Dicotyledons	**Class** MAGNOLIOPSIDA
Subclass ASTERIDAE	**Subclass ASTERIDAE**
Order LAMIALES	**Order** LAMIALES
Family LAMIACEAE – Mint family	**Family** PLANTAGINACEAE
Genus *OCIMUM L.* – basil	**Genus** *PLANTAGO* (Plantain or Indian-wheat)
Species *Ocimum Basilicum*	**Species *Plantago Ovata***



Psyllium seeds Basil seeds

Fig. 1. Visual Observation of seeds of selected medicinal plants

Because of this fact selected medicinal plants of our study contributed to treatment of various ailments such as digestive problems, constipation and lowering the cholesterol level in human beings from history to date.

Although it was not possible but as an alternative we conducted a questionnaire based survey by providing respondents with supplementary information about the proposed work and its application. We distributed this questionnaire in local community and academia people who have knowledge about these plants. Although a few of them responded yet we analyzed their responses and this analysis is given here.

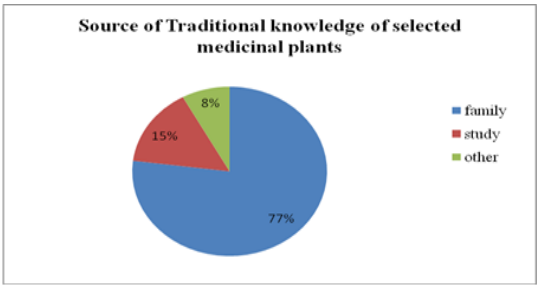


Fig. 2. What is source of traditional knowledge among surveyed respondents?

Figure 2 demonstrated that source of traditional knowledge about selected medicinal plants under surveyed. The results showed that 77 % surveyed people attained the traditional knowledge about sweet basil and psyllium for what purpose these plants used and consumed for health problem due to seasonal variations from their family members and 15 % people gained that knowledge from careful scientific study of selected medicinal those surveyed people might be belonged to that field of interest. We conclude from these observations, traditional knowledge about these selected medicinal plants still in the pipe line of scientific analysis.

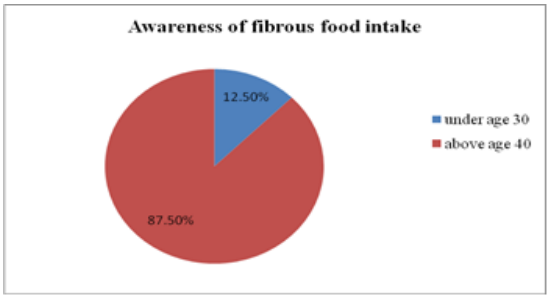


Fig. 3. Surveyed respondents awareness of fibrous food intake in relation to age factor

Figure 3 represented surveyed respondents awareness of fibrous intake in relation to age factor. The results showed that most of the people (87.50 %) who used these plants as a source of fiber were above age of 40. Many of the people under the age of 40 were at least aware of their existence but did not use medicinal plant more frequently as compared to other group of people. Some of them were unaware that actually these medicinal plants use as source of fiber which is due lack of knowledge in this category of surveyed people.

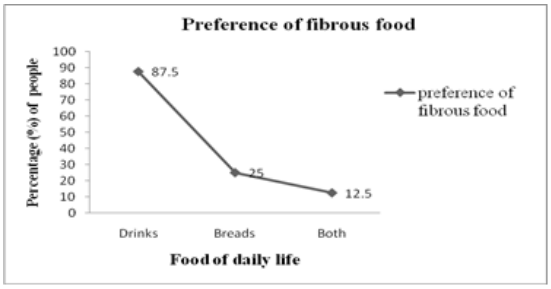


Fig. 4 What is preference of fibrous food intake among surveyed respondents?

From the above Figure 4, we came to know that most of surveyed people used these plants as source of fiber for cure of digestive problems but preference of intake was in the form of drinks which can be easily prepared in the home and has additional property of cooling in the summer season. For example Psyllium husk is commonly used by the people for laxative purpose and basil seeds soaked in water and sugar added drinks traditionally used by the people for cooling effect in summer. But until now there is no scientific study conducted to check the efficacy of these plants in this regards.

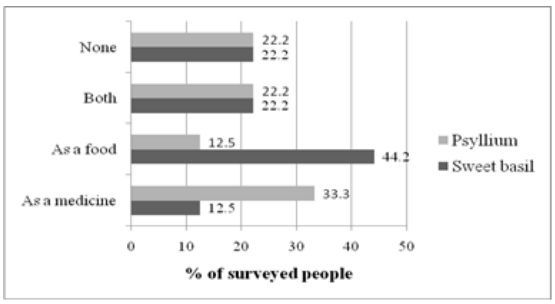


Fig. 5. Relationship between respondents for what purpose they used seeds of selected medicinal plants

From the Figure 5, results indicated that 33.3 % surveyed people used the psyllium husk as a medicated purpose whereas sweet basil seeds used by the people (44.2%) for recreation purposes. There is need to make more scientifically proven usage of these plants in daily life for both purposes such as medicinal and food.

The psyllium husk is considered as safe with least adverse effects on human health with sufficient amount of soluble fiber as compared to other cereals. Psyllium as naturally occurring source of soluble fiber it has gained increased importance in food industries [6].

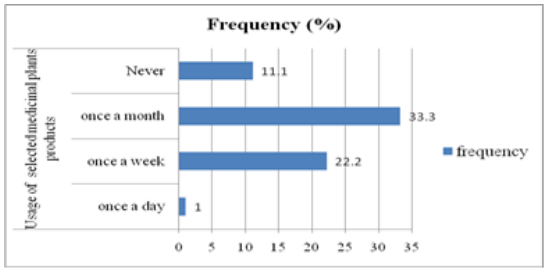


Fig. 6. Frequency (%) distribution of usage of selected medicinal plants among respondents

According to the above Figure 6, we concluded that frequency of usage of these selected medicinal was fall in category of once in a month if they feel to have some change from counter the medication for cure of common ailments. Based on these observations, 33.3 % people used these plants once in a month and then 22 % people used these plants once in a week. In our opinion, this long interval frequency of usage might be due to unaware of proper benefits of these plants that are reasons they were reluctant to consume them more frequently.

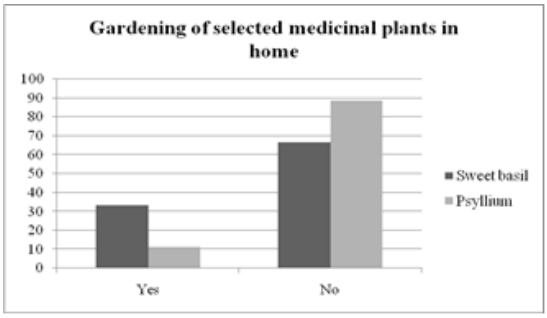


Fig. 7. Respondents opinion about gardening of selected medicinal plants in home

In the above figure 7, the respondents have also been asked about gardening of selected medicinal plants. The opinion of respondent was assessed by two catogories i.e. YES or NO. By this binomial type of question, we assumed that only sweet basil plants contain more yes for gardening of this plant in home for that might be due to traditional purposes. As there is huge scietific literature found for useage of sweet basil plant for tradtional and ritual bases recoreded from history to date. This depicted the importance of selected medicinal plant (sweet basil) more specific. According to the results of above question, 33.3 % was in the favour of gardening the sweet basil in home not only for the pleasant fragnance but also for ritual and recreational purposes. On the other hand the less people were agreed to grow psyllium plant in home.

In the last and the foremost question in our survey was to know about the people opinion which kind of grains they preferred to consumed as a source of nutrients.

Under surveyed people 66.6 % people preferred to consumed whole grains as compared to refined grains.

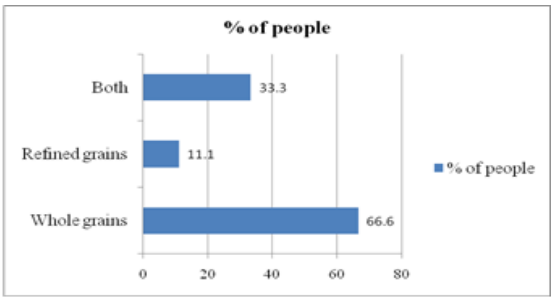


Fig. 8. Respondent opinion about what type of grains they consumed as a source of fiber

Many of them preferred to consume both grains as whole and refined. But majority of surveyed people preferred to consume whole grains because of complimentary nutrients are integrated in the whole grains.

The purpose of this question was to analyses the response of people for better preparation of novel food products utilizing whole grains more preferably according to the need of consumers.

CONCLUSIONS

Our study has a value addition in the exiting indigenous knowledge regarding the utilization of seeds of selected medicinal plants for various purposes.

The study highlights the people interest in sweet basil seeds as non conventional source of fiber and how frequently they are using these plants seeds in their routine life.

This present study better comprehend the consumer's response for better and effective use of these plants in the food products. Present investigations highlights efficacy of selected medicinal plants in comparison in order to conclude which plant has better contribute as source of fiber according to opinion of respondents.

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Appendix I

Study on selected medicinal plants *Plantago ovata* (Isabgol, psyllium) and *Ocimum basilicum* (sweet basil) for value addition in food products. A BRIEF SURVEY

Keeping in mind that *Plantago ovata* and *Ocimum basilicum* medicinally important plants are little bit neglected species in this kind of nutritional estimation, it is decided to investigate their nutritional values that might be helpful for increasing the wealth of medicines and enrichment of functional food products. Research on plants species including medicinal, aromatic and staple food plants have been carried out to investigate nutrient constitutes providing large portion of daily human food consumption. However, there are little works in literature that concern to determine the worth of these plants together i.e. *Plantago ovata* and *Ocimum basilicum.* This work might be helpful for consumption of mucilage (source of soluble fiber) from seed of basil with non conventional source of fibers and fats. Furthermore, sweet basil seeds and psyllium husk in drinks has multiple benefits for gastrointestinal problems in daily life.

Survey Questions

Location:
Circle One:
- Female
- Male

Age:
- (18-20)
- (21-30)
- (31-40)
- (41-50)
- (51+)

(1)Have you ever used Psyllium and Sweet basil seeds and leaves for medicinal and or cooking purposes?
(YES) (NO) If so which do you use most often? _____ _____

(2)Do you ever use medicinal plants (Psyllium and sweet basil) for digestion problems in place of manufactured products (i.e. Lactulose, Aspirin etc)?
(YES) (NO) If so, which ones most often? _____ _____ _____

(3)If you use medicinal products how often do you use them?
- Once a day
- Once a week
- Once a month
- Never
- Other_____

(4)If you use these plants for medicinal purposes where did you learn it from
- A family member
- A book/magazine
- Other_____

(5)Do you gardening Psyllium and sweet basil in your home?
(YES) (NO)

(6)Which medicinal plant more frequently use as source of fiber intake?
- Psyllium husk
- Mucilage of sweet basil seeds

(7)Preference of fiber intake from which food products
- Bread
- Drinks

(8)Fibrous food awareness in which level of people?
- Young (15-30 years)
- Old (35-50 years)

(9)Which age group intake more fibrous food?
- (18-20)
- (21-30)
- (31-40)
- (41-50)
- (51+)

(10)Do you eat whole grains (i.e. whole grain bread, brown rice etc?) or refined grains?
_____ _____

Thank you for your cooperation!

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A COMPARATIVE STUDY BETWEEN SEEDS OF SWEET BASIL AND PSYLLIUM ON THE BASIS OF PROXIMATE ANALYSIS

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Abstract

In addition to the medicinal values of selected plants, aim of current study was to estimate the nutrient profile of seeds of selected medicinal plant (sweet basil and psyllium) whether the intake of these seeds is not harmful. In view of proximate composition of seeds of psyllium and sweet basil not only remarkable source of biochemicals and can be used as potent nutrient elements in the diet. The seeds of selected medicinal plants analyzed using the standard methods (AOAC, 2000), findings showed that seeds have adequate amount of nutritional qualities. The seeds of sweet basil have sufficient amount of protein and mineral matter as compared to psyllium seeds. These findings seem to be good for health purposes. Moreover, results of this study indicated that seeds of psyllium are being abundant in energy values whereas excellent source of fiber too as compared to sweet basil. These results are promising to do further investigation in this vast field of research to explore novel sources of nutrient might be used for various purposes in different sector.

Key words**:** *proximate analysis, sweet basil, psyllium, medicinal plants, seeds*

INTRODUCTION

Plants influence our life on earth by providing us basic necessities such as food and shelter since time immemorial. Herbs not only play the crucial for maintenance of health in human beings by providing chemicals of medicinal value as well as nutrition required by our bodies for various biological functions [2]. At present, medicinal plants still play important role to generate income to the people of many developing countries of Asia and Europe such as: *Ocimum basilicum* and *Plantago ovata* which were focused plants of our study.

Ocimum basilicum L., commonly known as sweet basil is a foliage rich plant. It belongs to the family Lamiaceae cultivate throughout the world. Sweet basil is medicinally aromatic plant. From ancient times, basil (an aromatic herb) extensively cultivated and used to add distinctive aroma and flavor to food. The leaves (fresh or dried) and essential oils extracted from flowers of plants used by food, pharmaceuticals and cosmetic industries as aroma additives in food, phytochemicals in medicines and fragrance in cosmetics respectively [14]. On the other hand, *Plantago ovata* L. is belonging to the family Plantaginaceae. The common name of the plant is psyllium and locally known as Isabgol. It is herbaceous, stem less medicinal herb. Because of its utilization as health care purposes for many centuries in South Asia, and now different parts of the plant are widely consumed for its medicinal properties all over the world. Psyllium husk obtained from membranous covering of the seed traditionally prescribed for gastrointestinal problems. It is given as a safe laxative and particularly considered as beneficial in habitual constipation, dysentery and chronic diarrhoea when consumed with various modes of formulation. Moreover, it is extensively used in lower blood cholesterol levels on scientific basis and further utilized as stabilizer in ice cream making as well as in cosmetic industries [10]. Besides all this, deficiency of nutrients is wide spread due to limited resources as well as unawareness of non conventional source of nutrients from economically important but neglected species such as sweet basil and psyllium. There is need to explore nutritional

significant resources to promote health in addition to overcome food related problems of daily life. In comparative assessment by using the finding of this study we made a conclusion which plant or plant parts are rich in nutrition easily available for making healthy food products. It might be helpful for understanding that seeds of which plant has valuable source of nutrients and will give potential usefulness as food fiber, proteins, fats and mineral matter.

MATERIALS AND METHODS

The seeds of selected medicinal plants were collected from local market of Sibiu, Romania in month of May 2015. Clean seeds of both plants were examined under microscope for evaluation of morphological characteristics. Samples were prepared by coarsely ground the seeds of selected medicinal plants to 20 mesh on the basis of analysis requirement and stored in dry clean bottles for further analysis. For moisture analysis, we prepared samples of selected medicinal plants and then temperature in the moisture analyzer (Infrared AND ML.50) was set as 105˚C and moisture of the samples were determined in percentage (%) after 47 minutes. Standard methods were used to perform the proximate analysis of the samples for total ash, crude fiber, crude fats and proteins [3] [4]. Protein content of the samples was estimated by nitrogen values obtained which was performed by micro Kjeldahl method with three basic steps such as digestions, distillation and finally titration of the sample gave the amount of nitrogen [13]. The protein content was calculated by nitrogen value obtained multiply with a factor 6.25. The fat content (lipids) of the samples was determined by using solvent extraction method whereas solvent used was ethyl ether. The crude fiber was also calculated by the method described by [7]. Difference method was applied for obtaining the total carbohydrates of the samples analyze. Calculation of total carbohydrates was based on formulae such as; 100- (percentage (%) of protein+ percentage (%) of fats+ percentage (%) of ash+ percentage (%) of crude fiber) [4]. Total energy values of the sample material were estimated by multiplying the values of carbohydrates (%) by a factor 4 and then multiplying protein content (%) by a factor of 4 and finally fat content (%) by a factor of 9 after that took the sum of all obtained values gave the total energy concentration in kilocalories [9]. At the end all the resulted values were presented in percentage [8]. Proximate analysis was carried out three times for each parameter (protein, fats, fiber, mineral matter) of a plant sample. Hence, we derived the mean values in percentage by using Microsoft Excel.

RESULTS AND DISCUSSIONS

From the history to date, plants play the crucial role for both human and animals as source of food, nutrition and health care and also have significant participation in drugs preparation. On the base of present situation of increasing human population day by day and shortage of fertile land, there is a strong need to explore high-quality but cheap sources of protein and energy in order to alleviate hunger and nutrient deficiency of daily life [17]. The results found for moisture contents by use of moisture analyzer were described in Table 1. The values of moisture contents for psyllium seeds found as 7.7% and percentage of moisture contents by moisture analyzer for sweet basil seeds as 7.0%. Findings showed that there was a noteworthy difference between seeds for moisture results; this might be due to climate and storage conditions of seeds in Romania.

Fig. 1. Seeds of Ocimum basilicum (left) and Plantago ovata (right)

Mineral matter is considered as inorganic components of plant materials. Mineral are the nutrients that are essential factors for maintaining human body functions such as metabolism and other vital physiological processes. In this perspective, mineral matter as a whole from plant sources such vegetables, grains and seeds as a mineral supplement in diet required for human well being in daily life.

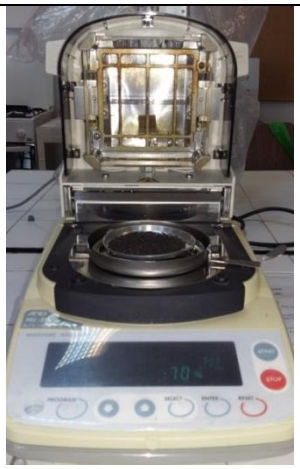

Fig. 2. Sweet basil seeds in moisture analyzer

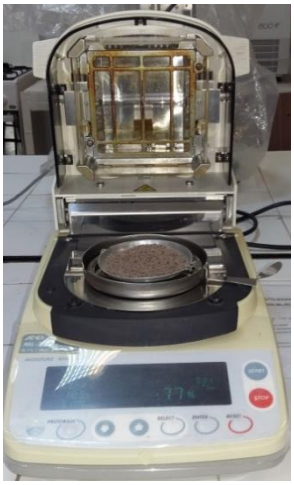

Fig. 3. Psyllium seeds in moisture analyzer

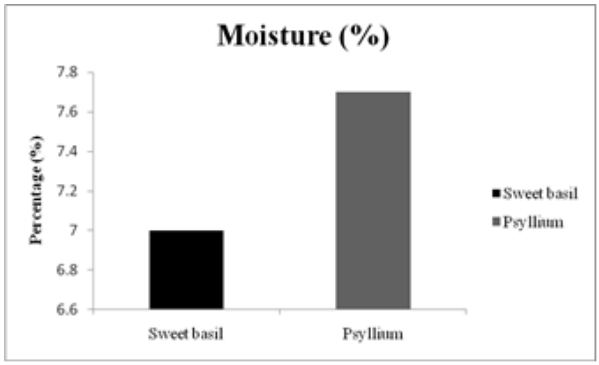

Fig. 4. Moisture percentage (%) comparison between seeds of Sweet basil and Psyllium

Total mineral of selected medicinal plant (sweet basil and psyllim) estimated by standard method through calcinations we found that sweet basil contained the high amount of mineral (6.5 %) as compared to psyllium seeds (3.4 %) presented in (Fig. 5).

Ocimum seeds have characteristics properties as a source of mucilage which contains a remarkable concentration of cellulose and hemicelluloses forming non digestible part of the plant.

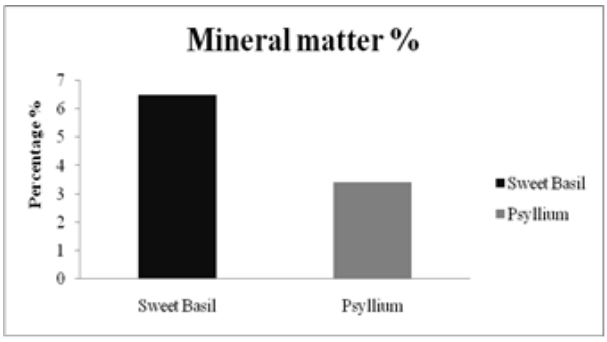

Fig. 5. Mineral matter percentage (%) comparison between seeds of Sweet basil and Psyllium

They become bulky accounting for their hydrophilic characters. Seeds and husk of both plants contained reasonable amount of soluble fiber and associated nutritional properties, and might be dietary supplements as a new enhancement in food products.

The importance of soluble fiber in the diet is very well established due its potent characteristic properties in terms of maintaining better bowel functions [5]. Scientific literature has shown that, basil seeds as new non-conventional sources of dietary fiber have already been discussed specifically [5] [12]. *Plantago ovata* as a whole plant basis contained fiber content 7.3% and proteins 2.3% reported by [19]. On the basis of these findings, our results for crude fiber (2.1%) for basil seeds were in against of reported study on basil seeds as crude fiber were found as 22.6% [12].

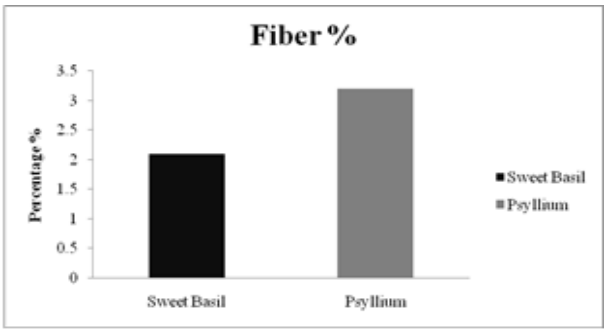

Fig. 6. Fiber percentage (%) comparison between seeds of Sweet basil and Psyllium

In case of protein content, sweet basil had higher amount of protein content compared to psyllium (Table 1).

It has been reported in the previous studies that protein deficiencies in food is a major factor of malnutrition and responsible for nutritional pathology [15]. The plant based food that provide more than 12 % its calorific value of protein is considered as remarkable supply of protein [13].

The results indicated that sweet basil seeds contained high protein contents (29%) as compared to psyllium seeds (24.5%).

These findings suggested that sweet basil seeds with rich source of protein contents might be valuable for human health in nutritional point of view as compared to seeds of psyllium.

The protein content of sweet basil and psyllium seeds determined on the basis of the nitrogen analysis using Kjeldahl method and protein value is observed in the range of 29 % to 24.5 % respectively. According to WHO [18], daily proposed amount of protein for men and women is different as men required lesser protein (14.5%) as compared to women (53.3%). Based on these observations, if the seeds of sweet basil become part of food products on daily basis then they might be satisfying the recommended values of protein.

Table 1 presented proximate compositions of seeds of selected medicinal plants.

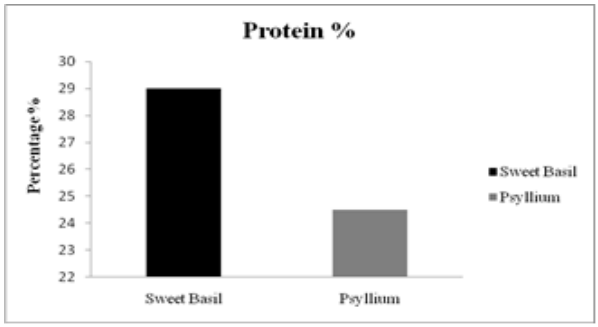

Fig. 7. Protein percentage (%) comparison between seeds of Sweet basil and Psyllium

Based on the observations of current study for estimation of fats contents (Lipids), sweet basil seeds contained low fat contents (15.36%) in comparison with psyllium seeds (16.55%) but there was not great difference in the values of fat contents in both selected seeds of sweet basil and psyllium (Figure 8). According to the authors of reported work, seeds of sweet basil possessed fat content in perecentage of 20.2% whereas crude fats was reported in psyllium seeds as 43.2% which was not in aggreement with our findings [6] [16]. Moreover results in other scientific study supported our finding for fats content in the seeds. They reported the fat contents in sweet basil seeds as 13.8% which was closer to our findings for fat contents in sweet basil seeds [12]. Fats (lipids) are a good source of energy in nutritional point of view as one gram of lipids provide 9 Kcal of energy. The results indicated that both the seeds of sweet basil and psyllium might be good source of lipids.

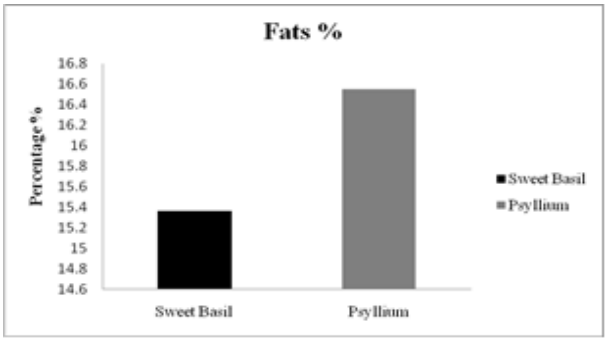

Fig. 8. Fats (%) comparison between seeds of Sweet basil and Psyllium

Table 1. Proximate analysis of seeds of Sweet basil and Psyllium (Sweet basil (*Ocimum basilicum*) and Psyllium (*Plantago ovata*)

Sample Name	Moisture (%)	Fats (%)	Protein (%)	Fiber (%)	Mineral matter (%)
Basil seed	7	15.36	29	2.1	6.5
Psyllium	7.7	16.55	24.5	3.2	3.4

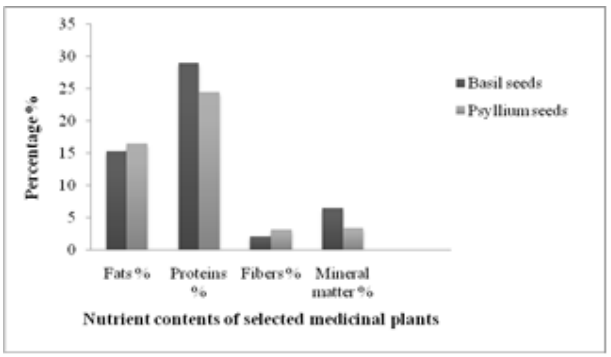

Fig. 9. Percentage (%) comparison among proximate compositions of selected medicinal plants

Carbohydrates are the principle and primary source of energy in the body. Looking at the results of present study, we observed that lower carbohydrate contents of sweet basil seeds

might be due to lesser amount of dietary fiber in the seeds.

The dietary fiber contains the cellulose, hemicelluloses, gums and mucilage which are considered as indigestible carbohydrates.

Human dietary fibers mainly come from plant cell walls in seeds, fruits and vegetables [11].

The results of the study suggested that seeds of psyllium have higher amount of carbohydrates (52.35%) as compared to seeds of sweet basil (47.04%).

According to (WHO, 1990), recommended ration of the carbohydrate content as an energy in a food is from 55 to 75%.

Although, the range of carbohydrates of both selected seeds were lower than proposed value of (WHO, 1990). However, seeds of both plants can be used as a source of energy and a valuable contribution in a food chain.

According to scientific work of Agunbiade, Ojezele, & Alao [1], leaves of basil contained the carbohydrates (66.65%) which were not correlated to our findings.

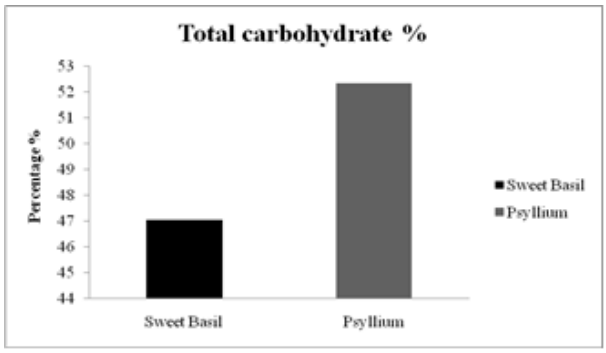

Fig. 10. Total carbohydrate percentage (%) comparison between seeds of Sweet basil and Psyllium

This difference of carbohydrates was due to source of carbohydrates from leaves of plants not from seeds until now there was no proper study was conducted on the seeds of sweet basil for assessment of total carbohydrates whereas *Plantago ovata* leaves and seeds contained the carbohydrates in the percentage values of 15.9 % and 8.4 % respectively reported by [6] which was not in accordance to our observations. According to total energy calculations based on percentage values of carbohydrates, proteins and fats, they possessed, we found higher energy values in the seeds of psyllium seeds (456.35 kcal) whereas basil seeds contained lower energy values (442.4 kcal) presented in the Table 2.

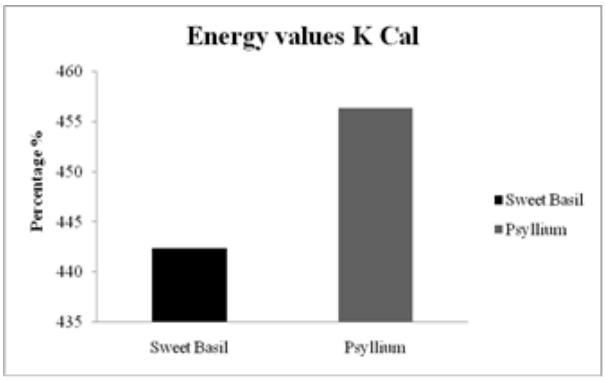

Fig. 11. Total Energy values percentage (%) comparison between seeds of Sweet basil and Psyllium

We concluded from these observatons, psyllium seeds had highest energy values might be due high percentage of fibers, fats and carbohydrates as compared to swet basil seeds that had only protein and mineral matter contents in higher quantity in comparison with psyllium seeds.

Table 2. Quality analyses of seeds of Sweet basil and Psyllium (Sweet basil (*Ocimum basilicum*) and Psyllium (*Plantago ovata*)

Sample Name	Total carbohydrate %	Total Energy (kCal/100 g)
Basil seed	47.04	442.4
Psyllium	52.35	456.35

According to the reported work of [7], on different medicinal plants which were commonly used as anti-inflammatory, antiviral, antimicrobial and as laxative like our selected medicinal plants, results for energy values were in the range of 389.20 kcal to 331.50 kcal considered as good source of energy that was close to our findings. Moreover, under careful review of literature we could not found the exact scientific study related to our current work.

CONCLUSIONS

As we already know herbs, nutrients and dietary supplement are major contributors of food which help to enhance the structure and function of the body. Therefore, in this work

we focused to find non conventional source of nutrients by screening and comparative assessment for possible enrichment of food products to tackle health related problems of daily life. So we evaluated our work with respect to nutritional analysis of seeds of selected medicinal plants. Evaluating nutritional significance of sweet basil and psyllium together on comparative basis can play a vital role in controlling minor ailments thus help to maintain health and further to promote the quality of life.

ACKNOWLEDGMENTS

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POST-HARVEST PRACTICES AND ALTERATION RISKS RELATED TO THE SALE OF PINEAPPLE IN ABIDJAN MARKETS

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Abstract

In the context of post-harvest conservation, a diagnosis of the pineapple orchard and risk factors for alterations related to fruit marketing was carried out by conducting a cross-sectional survey in the three major pineapple producing areas and four main areas Markets (Adjamé-Yopougon-Abobo-Plateau) in the Abidjan district (Ivory Coast). A sample of 250 producers and 200 traders was surveyed. The objective was to describe the post-harvest practices and risk factors associated with the commercialization of pineapple fruit. The results showed that the producers are men (100%), mainly illiterate (78.03%) and have an average age between 46 and 60 years (55.1%). Eighty percent (80%) are small growers with orchards under 10 ha. The plant material used by all the producers in the studied areas is composed mainly of 94.13% of discharges and chemical pesticides are used 100%. The harvest is 81.76% manual, unsorted and packaged in bulk (81.77%). Thus only 5.86% recognize that post-harvest losses are due to microorganisms. Also the traders investigated are mostly women (87.1%) and illiterate (70.7%) with a majority of age between 20 and 45 years. 97.73% of the sellers do not protect the fruits during the sale while 22.22% of the sellers carry out a cross-stocking with other fruits. Of all the municipalities investigated, all traders do not recognize the action of microorganisms in the alteration of the fruits. In the absence of sound health education and locally adapted interventions, producers and traders do not pay particular attention to preventing the risk of alterations. This study identified post-harvest practices in Ivorian pineapple plantation and the risk factors for alterations related to commercialization in the markets.

***Key words**: pineapple, alterations, post-harvest, diagnosis, Ivory Coast*

INTRODUCTION

In Ivory Coast, the culture of pineapples is highly developed in the South-East of the country. It occupies an area of 16,000 ha and contributes 0.6% to GDP [10]. With 33,976 tons of fruits exported in 2014, the country ranks first among African exporters a head of Ghana (33,175 tonnes) [17]. About 2,500 small pineapple growers produce 80% of the production in a traditional way. On the other hand, there are industrial-type farms that intensively produce fruit for export. Consumption of fruits and vegetables is recommended in several countries for protection against diseases such as cancer, obesity, cardiovascular diseases and the benefits of their fibers, as well as the good progress of intestinal transit [7,9,19]. Fresh pineapple and crop wastes such as crowns are rich in bromelain. This cysteine protease has numerous therapeutic properties, in particular as anti-inflammatory, anti-thrombic, fibrinolytic and anti-cancer agent [8,11]. It is a highly perishable tropical fruit that must be handled with care and transported under the best conditions to avoid its senescence, its degradation by pathogens or hazardous manipulations. Indeed, the quality of tropical fruits such as pineapple is generally affected by post-harvest diseases such as fruit rot, which is mainly caused by handling and inadequate

storage during transport and marketing [22]. Approximately 20-25% of the harvested fruit is altered by these agents during post-harvest handling, even in developed countries. This has a negative impact on the economic value of the fruit. The cost of post-harvest losses represents about 40-50% of global production annually [16]. Also, there are no data on post-harvest practices in production areas and factors of alteration related to the commercialization of pineapples. The aim of this study was to identify the reality of post-harvest practices in the pineapple production areas and the risk factors for alterations related to the sale of fruit, through a process of interviews with producers and traders. The information gathered will allow establishing a database relating to the practice of the production and marketing of pineapples in Ivory Coast. To this end, it is important to know the characteristics of producers and traders and to identify the environment for post-harvest activities.

MATERIAL AND METHODS

Study area

A survey of different productions and marketing sites identified three main pineapple production sites (Bonoua-Dabou-Tiassalé) and four marketing markets (Abobo-Adjamé-Yopougon-Plateau) for this study.

Preliminary Investigation

The study population is made up of pineapple producers and traders. A file of questions was developed and divided into two sections for each group: the first section concerned age, gender, nationality and level of study of farmers and traders. The second section dealt with the characteristics of production and post-harvest activities for producers and the conditions of sale for traders. The survey lasted twelve months (2016) and covered a total of 150 producers and 200 traders.

Statistical analysis

The different data obtained were processed with statistical software SPSS 11.05. Recordings were carried out for their exploitation. Analysis of one-factor variance (ANOVA) was carried out using STATISTICA 8.0 software to compare the parameters (response variables) studied. For the significant differences between these parameters (response variables), the average ranking was done according to the Newmann-Keuls test at the 5% threshold. The differences are considered significant for values of $P < 0.05$.

RESULTS AND DISCUSSIONS

Post-harvest practices in pineapple producing areas

Characteristics of pineapple producers

The characteristics of the pineapple producers are shown in Table 1. Pineapple culture is devoted to 100% men regardless of the areas of production. The owners of the different plantations of the areas investigated are Burkinabes at 62.17%, while the Ivorians represent 37.83%.

Table 1. Characteristics of pineapple producers in the three pineapple production areas

Characteristics of respondents	Distribution of pineapple producers (%)			
	Production areas			Means
	Bonoua	Tiassalé	Dabou	
Gender				
Mens	100[a]	100[a]	100[a]	100±0,0
Womens	0[a]	0[a]	0[a]	0±0.0
Nationality				
Ivoirian	23.5[a]	40[a]	50[a]	37.83±13.38
Burkinabe	76.5[a]	60[a]	50[a]	62.17±13,38
Age (years)				
15-30	11.8[a]	0[a]	0[a]	03.93±6.81
31-45	38.2[a]	20[a]	10[a]	22.73±14.29
46-60	35.3[a]	60[a]	70[a]	55.1±17.86
>60	14.7[a]	20[a]	20[a]	18.23±3.05
Level of study				
No education	94.1[a]	60[a]	80[a]	78.03±17.13
Primary	5.9[a]	0[a]	0[a]	01.97±3.40
Secondary	0[a]	20[b]	0[a]	06.67±11.54
Superior	0[a]	20[a]	20[a]	13.33±11.54
Experience (years)				
3	2.9[a]	0[a]	0[a]	0.97±1.67
4-10	11.8[a]	40[a]	50[a]	33.93±19.80
11-20	11.8[a]	40[a]	30[a]	27.27±14.29
>20	73.5[b]	20[a]	20[a]	37.83±30.88

For each characteristic of pineapple producers, on-line values with the same letters are not significantly different at the 5% threshold according to the Newmann-Keuls test.
Source: Own calculation

The majority of these producers (55.1%) are between 46 and 60 years of age. However, no significant differences ($P > 0.05$) exist between the age groups of producers in the three areas

investigated. Few producers are between the ages of 15 and 30 (3.93%).

The education rate of producers is low. For example, 78.03% of producers did not receive any education. The distribution of out-of-school youth in Bonoua, Tiassale and Dabou is 94.1%, 60% and 80%, respectively. However, no significant differences (P> 0.05) exist between the proportions of illiterate producers in the three zones. Of the educated producers, 1.97% have the primary level, 6.67% the secondary level and 13.33% the higher level.

There are no significant differences (P> 0.05) in the proportions of the educated producers in the three areas. The majority of producers (37.83%) have more than 20 years of experience in pineapple culture, followed by those with 4 to 10 years of experience (33.93%) compared to only 0.97% whose production experience is less than 3 years.

Crop descriptions

Table 2 presents the crop description in the three pineapple production areas. In all three areas, more than half of the producers (58.63%) have a plantation of up to 1 hectare in size. This is the case in Bonoua (55.9%), Tiassale (60%) and Dabou (60%). However, no significant difference (P> 0.05) was observed between the three production areas. Producers with a plantation of more than 5 hectares account for 21.17%, followed by those of 2 to 3 hectares (10.60%) and 3 to 4 hectares (9.60%). No significant difference (P> 0.05) was observed between the size of the plantations in the three areas.

In all three areas, MD2 is the most cultivated variety with 92.73% compared to 7.27% for the smooth Cayenne variety. No significant difference (P> 0.05) was observed in each variety from one area to another.

The plant material used by all the producers in the study areas is composed mainly of 100% pesticides and 94.13% of releases compared with 5.87% of rejects and crowns.

However, no significant difference (P> 0.05) was observed in the use of each input from one area to another. None of the producers use biological pesticides in each of the three areas.

Harvest

The distribution of pineapple fruits harvested in the three production areas is presented in Table 3.

Table 2. Crop descriptions in the three pineapple production areas

Crop description	**Distribution of pineapple producers (%)**			
	Production areas			**Means**
	Bonoua	**Tiassalé**	**Dabou**	
Planting (Ha)				
0-1	55.9[a]	60[a]	60[a]	58.63±2.36
2-3	11.8[a]	0[a]	20[a]	10.60±10.05
4-5	8.8[a]	20[a]	0[a]	9.60±10.02
> 5	23.5[a]	20[a]	20[a]	21.17±2.02
Variety				
MD 2	88.2[a]	100[a]	90[a]	92.73±6.53
Smooth cayenne	11.8[a]	0[a]	10[a]	7.27±6.35
Inputs				
Pesticides	100[a]	100[a]	100[a]	100±0
Bio pesticides	0[a]	0[a]	0[a]	0±0
Rejects	82.4[a]	100[a]	100[a]	94.13±10.16
Rejects and crowns	17.6[a]	0[a]	0[a]	5.87±10.16

For each characteristic of pineapple producers, on-line values with the same letters are not significantly different at the 5% threshold according to the Newmann-Keuls test.
Source: Own calculation

Table 3. Distribution (%) of pineapple fruits harvested according to production areas

Productions areas	Distribution of pineapple producers (%)	
	Mature Fruits	Immature Fruits
Bonoua	100[a]	0[a]
Tiassalé	100[a]	0[a]
Dabou	100[a]	0[a]
Means	100±0.0	0.0±0.0

For each characteristic of the producers of pineapples, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test.
Source: Own calculation

The survey revealed that all producers (100%) harvest the fruits of pineapple when mature after treatment with ethephon.

However, no immature fruits are harvested in any area of production. No significant difference (P> 0.05) was observed in fruit maturity from one area to another.

Means of harvesting

The distribution of the method of harvesting pineapple fruits is presented in Table 4.

Irrespective of the area of pineapple production, hand-harvesting (81.77%) is the most widely used method for producers. However, 18.23% of producers use the knife for harvesting. The results obtained differ

significantly (P <0.05) according to the harvesting method used in the three production areas.

Table 4. Distribution (%) of the harvesting method according to the production areas

Productions areas	Distribution of pineapple producers (%)	
	Manual harvesting (hand)	Mechanical harvesting (knife)
Bonoua	85.3[a]	14.7[a]
Tiassalé	80[a]	20[a]
Dabou	80[a]	20[a]
Means	81.77±3.05	18.23±3.05

For each characteristic of the producers of pineapples, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test.
Source: Own calculation

Table 5. Distribution of producers (%) of fruit of pineapple fruit sorting prior to sale according to production areas

Productions areas	Distribution of pineapple producers (%)	
	Sortng fruit	No sorting fruit
Bonoua	1[a]	99[a]
Tiassalé	0[a]	100[a]
Dabou	0[a]	100[a]
Means	0.33±0.58	99.67±0.58

For each characteristic of the producers of pineapples, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test.
Source: Own calculation

Table 5 presents the distribution of producers who sort fruit from pineapple before being put up for sale.
In most cases, all producers (99.67%) do not sort fruits before they are placed on the market. This is the case for the producers of Bonoua (99%), Tiassalé (100%) and Dabou (100%). No significant differences (P> 0.05) exist between the different production areas for the sorting of the fruits before the sale.
However, some producers (0.33%) sort the fruits of pineapple during the harvest before the sale.

Conditioning of pineapple fruits after harvest
The method of packaging used by producers for the storage of pineapple fruits according to the production areas is given in Table 6.
The bulk packaging is mainly used by producers at 81.77% against 18.23% of Cardboard packaging. However, statistical analyzes show that these variations in the type of containers used are significant (P <0.05).

Modes of conservation of pineapple fruits after harvest

Table 6. Distribution (%) of the mode of conservation of pineapple fruits according to the production areas

Productions areas	Distribution of pineapple producers (%)	
	Cardboard packaging	Bulk packaging
Bonoua	14.7[a]	85.3[a]
Tiassalé	20[a]	80[a]
Dabou	20[a]	80[a]
Means	18.23±3.05	81.77±3.05

For each characteristic of the producers of pineapples, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test.
Source: Own calculation

Table 7 shows the method of conservation used by producers during storage of pineapple fruit. In all production areas, all producers (100%) use no means of conservation.

Table 7. Distribution (%) of conservation according to the production areas

Productions areas	Distribution of pineapple producers (%)	
	Conservation	No conservation
Bonoua	0[a]	100[a]
Tiassalé	0[a]	100[a]
Dabou	0[a]	100[a]
Means	0.0±0	100±0.0

For each characteristic of the producers of pineapples, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test.
Source: Own calculation

Post-harvest losses
The distribution of post-harvest losses of pineapple fruits by producers is given in Table 8. Post-harvest losses are mostly due to injuries or shocks during the harvest, such as in Bonoua (82.4%), Tiassale (100%) and Dabou (100%). There was no significant difference (P> 0.05) between post-harvest losses of pineapple fruit from one production area to another.
Of all the areas investigated, 94.13% of producers acknowledge that crop losses are caused by injuries or shocks, compared to 5.87% of producers who report the action of micro-organisms.

Table 8. Distribution (%) of post-harvest causes by production area

Productions areas	Distribution of pineapple producers (%)	
	Microorganisms	Injuries or shocks
Bonoua	**17.6[a]**	**82.4[a]**
Tiassalé	0[a]	100[a]
Dabou	0[a]	100[a]
Means	5.87±10.16	94.13±10.16

For each characteristic of the producers of pineapples, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test.
Source: Own calculation

Alteration risk factors related to the sale of pineapple in abidjan markets

General characteristics of pineapple sellers

The characteristics of the sellers of pineapple fruits are presented in Table 9. The sale of fruit in the markets is exclusively carried out by women (87.1%) compared with 12.9% of men.

Table 9. Distribution (%) of the characteristics of pineapple sellers in the markets of Abidjan

Characteristics of sellers	Municipalities investigated (%)				
	Abobo	Adjamé	Yopougon	Plateau	Means
Gender					
Men	16.7[a]	16.7[a]	0[a]	18.2[a]	12.9±8.62
Women	83.3[a]	83.3[a]	100[a]	81.8[a]	87.1±8.62
Ages (years)					
20-30	50[a]	58.3[a]	53.3[a]	45.5[a]	51.76±5.39
30-45	25[a]	16.7[a]	40[a]	27.3[a]	27.25±9.64
45-60	25[a]	25[a]	6.7[a]	18.2[a]	18.72±8.63
>60	0[a]	0[a]	0[a]	9.1[a]	2.27±4.51
Level of study					
No	66.7[a]	83.3[a]	66.7[a]	63.6[a]	70.08±8.93
Primary	16.7[a]	16.7[a]	33.3[a]	36.4[a]	25.78±10.55
Secondary	8.3[a]	0[a]	0[a]	0[a]	2.07±4.15
Superior	8.3[a]	0[a]	0[a]	0[a]	2.07±4.15
Experience (years)					
< 2 ans	33.3[a]	16.7[a]	13.3[a]	9.1[a]	18.1±10.59
2-5	33.3[a]	50[a]	66.7[a]	72.7[a]	557±17.74
6-11	8.3[a]	25[a]	20[a]	0[a]	13.32±11.30
12-17	16.7[a]	8.3[a]	0[a]	18.2[a]	10.9±8.41
18-23	8.3[a]	0[a]	0[a]	0[a]	2.08±4.15

For each characteristic of pineapple sellers, on-line values with the same letters are not significantly different at the 5% threshold according to the Newmann-Keuls test.
Source: Own calculation

The majority of sellers are between 20 and 45 years of age. However, there was no significant difference (P> 0.05) between the sellers age according to the municipalities investigated. Few sellers are older than 60 (2.27%). The rate of school attendance of female sellers is low. As a result, 70.7% of female sellers received no education. Of the female school-leavers, 25.77% have the primary level, 2.07% the secondary level and 2.07% the higher level. There is no significant difference (P> 0.05) between the rate of schooling of female sellers by municipalities.

The majority of sellers (55.7%) have a 2 to 5 years of experience in selling pineapple fruits, followed by those with less than 2 years of experience (18.1%) versus only 2.08 % With a business experience of between 18 and 23 years. No significant difference (P> 0.05) was observed in the commercial experience of the actresses according to the municipalities under investigation.

Pineapple Fruit Supply Areas

Table 10 shows the supply areas for pineapple fruits according to the markets of the municipalities.

Table 10. Distribution of Fruit Supply Areas by Municipalities

Municipalities investigy	Supply areas (%)	
	Bonoua	Dabou
Abobo	100[a]	0[a]
Adjamé	91,7[a]	8,3[a]
Yopougon	80[a]	20[a]
Plateau	100[a]	0[a]
Means	92.92±9.46	7.08±9.46

For each characteristic of the pineapple sellers, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test
Source: Own calculation

The fruits sold in the markets mainly come from the town of Bonoua (92.92%). All Abobo (100%) and plateau (100%) sellers get their supplies from Bonoua. In the municipalities of Adjamé and Plateau, 8.3% and 20% of salespeople source their fruit from Dabou. The results do not differ significantly (P> 0.05) according to the areas of supply of the municipalities.

Duration of sales of pineapple fruits

Table 11 shows the duration of sales of the quantities of fruit according to the municipalities. On average, 67.77% of sellers sell their retail stock for a minimum of 2 days. On the other hand, 32.23% of the sellers sell their stock over a period of 3 days until exhaustion. The fruits of Abobo sellers sell faster (2 days), 100% of the stocks, followed by those of Adjamé (83.3%) and Plateau

(54.5%). The municipality which has difficulty in selling its fruit stock is Yopougon (66.7%) for a maximum of 3 days. There is a significant difference (P <0.05) between the time of sale according to the communes. No sellers take more than 3 days to sell the available stock.

Table 11. Distribution of the period of sale of fruit in the markets of the various municipalities

Municipalities investigated	Term of sale (%)	
	2 days	3 days
Abobo	83.3^{bc}	16.7^{ab}
Adjamé	100^{c}	0^{a}
Yopougon	33.3^{a}	66.7^{c}
Plateau	54.5^{ab}	45.5^{bc}
Means	67.77±29.68	32.23±29.68

For each characteristic of the pineapple sellers, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test
Source: Own calculation

Conditions of sale of pineapple fruits

Table 12, which presents the sales conditions for pineapple fruit, shows that 97.73% of sellers do not protect fruit during sale in markets. In Abobo, 100% of sellers do not cover fruit during the sale, as do those of Adjamé and Yopougon. No significant difference (P> 0.05) was observed between fruitless sellers during sale in all communes. However, 2.27% of sellers protect the fruit during the sale. Thus, in the Plateau, the sellers (9.1%) protect the fruit during the sale. However, there is no significant difference (P> 0.05) between the sellers who protect the fruit during the sale in all the municipalities.

Table 12. Distribution (%) of the mode of sale of pineapple fruits in the markets of the different municipalities

Municipalities investigated	Mode of sale (%)	
	Covered pineapple	Pineapples not covered
Abobo	0^{a}	100^{a}
Adjamé	0^{a}	100^{a}
Yopougon	0^{a}	100^{a}
Plateau	9,1^{a}	90,9^{a}
Means	2.27±4.55	97.73±4.55

For each characteristic of the pineapple sellers, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test
Source: Own calculation

Storage Conditions

In most of the municipalities investigated, the majority of sellers (77.78%) store pineapple fruits alone, while 22.22% sell pineapple fruit with other fruits. Most of the sellers in the municipalities of Adjamé (100%), Abobo (83.3%) and Yopougon (73.3%) practice a non-cross-storage of pineapple fruits. However, the statistical analyzes showed no significant difference (P> 0.05) regarding the storage mode of pineapple fruits (Table 13).

Table 13. Distribution (%) of the mode of storage of pineapple fruits in the markets of the different municipalities

Municipalities investigy	Storage mode (%)	
	Cross-storage	Non-cross-storage
Abobo	16,7^{ab}	83.3^{ab}
Adjamé	0^{a}	100^{b}
Yopougon	26.7^{ab}	73.3^{ab}
Plateau	45.5^{c}	54.5^{a}
Means	22.22±19.02	77.78±19.02

For each characteristic of the pineapple sellers, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test
Source: Own calculation

Table 14 shows the distribution of alteration of pineapple fruit in markets according to the municipalities. Of all the municipalities investigated, not all sellers recognize that the alteration of pineapple fruit could be due to microorganisms. No significant difference (P> 0.05) was observed between traders who did not recognize the alteration of pineapple fruit in each municipality investigated.

Table 14. Distribution (%) of the alteration of pineapple fruit in the markets of the different municipalities

Municipalities investigated	Distribution of pineapple sellers (%)	
	Recognition microbial alteration	Non-recognition microbial alteration
Abobo	0^{a}	100^{a}
Adjamé	0^{a}	100^{a}
Yopougon	0^{a}	100^{a}
Plateau	0^{a}	100^{a}
Means	0±0	100±0

For each characteristic of the pineapple sellers, columns, values bearing the same letters are not significantly different from the 5% threshold according to the Newmann-Keuls test
Source: Own calculation

Information obtained on post-harvest practices showed that pineapple culture is a male activity in Ivory Coast. Indeed, it is 100% dedicated to the men whatever the zone of production. From

one production area to another, the proportions of men and women do not differ significantly.

One of the fundamental reasons is that the virtual absence of women in this activity could be due to the painfulness, that is to say, to the immense physical effort which must be provided for the creation of a field of study, pineapple. Indeed, courageous women, capable of clearing a dense forest up to development are not possible. This may explain the absence of women in the production of pineapple fruit. This situation may also be explained by the fact that in rural areas, women are all considered as housewives. Nevertheless, it is important to emphasize that women are essential aids alongside their spouses, as they are an essential link in the pineapple production chain. Indeed, producers reported that women generally take an active part in harvesting fruit during harvesting.

At the time of this study, the majority of producers in the three investigated areas with experience in pineapple production were between 46 and 60 years of age or more. This means that there are elderly people among the pineapple producers. The aging of producers results in a decline in their rural activities and inevitably a decrease in yield.

The majority of producers in the study areas testified that they had not attended school. The high rate of literacy would come from the low level of education of the Ivorian population in the 1970s. This could also be explained by the fact that pineapple was initially cultivated only by illiterates [4]. On the other hand, in recent years "intellectuals" and some "pensioners" have begun to invest in agriculture [4]. This observation is similar to that of Assa et al. (2006) [3] on the coconut plantation of the Ivorian coastline concerning the age and intellectual level of producers.

In general, over half of all pineapple producers in the three areas studied have more than 10 years experience, most of them Burkinabe. This implies that these producers have some experience in the culture of pineapples. This may be explained by the migration of populations from Burkina Faso to these areas of the South and South-East (Dabou-Tiassale-Bonoua) Main production areas of pineapple. Migration was politically supported and accelerated from 1960 [24, 17].

The cultural descriptions showed that the size of the plantations of not more than one hectare represents more than half of all the pineapple crops of the areas investigated. This result reflects the disinterestedness of the peasants with respect to this culture as reported by Colin in 2012 [12]. The MD2 variety developed in the 1990s is now mainly cultivated in all three zones. This latter variety has much more advantages in terms of organoleptic qualities than the smooth Cayenne originally representing the totality of Ivorian production [18]. In most cases, the releases constitute the plant material of production as reported by Agrisol in 1992 [1] in similar studies. The high costs of vitroplants could be one of the reasons for the use of discharges. Also, the discharges present an increased susceptibility to the diseases in contrast to the vitroplants. The exclusive use of chemical pesticides could be explained by the fact that these substances have always been considered the most effective weapons against phytopathogens [25] and the lack of a national research policy in biological control.

The fruit must be harvested at the right ripeness, in order to avoid possible rotting of the fruit. Voluntarily, no producer collects immature fruits. The presence of immature fruits in the crops is usually the result of accidental picking.

The exclusive use of the hand for the harvest would be due to its speed in this operation, but it could cause the fungal alteration of the fruits. Effect, according to FruiTrop (2013) [17], the use of the hand presents enormous inconveniences such as the contamination manuported which are causes of alteration of the fruits. Also the section of the peduncle constitutes a gateway for fungal strains when not soaked in fungicide solutions [15].

Almost all growers do not sort fruits before they go on sale. This observation confirms the observation by several authors [2, 23] that fruit sorting is the first step in post-harvest treatment of fruit during which mold may develop. Therefore, eliminating poor quality fruits, such as injured, altered or immature fruits, means

avoiding sites of abundant mold growth and cross-contamination.

Out of the three production areas, the packaging is mainly made in bulk. This mode of conditioning and storage leads to a high risk of fungal infections in the environment. Indeed, according to FruiTrop (2013) [17], harvested pineapple is a perishable commodity that deteriorates rapidly if storage conditions are not adequate. The use of this method of packaging would be due to the absence of the technical supervision structures which should regularly raise the awareness of producers on good post-harvest practices. Also, the high cost of the cardboard would be at the origin of this choice.

In the different production areas, there is no means of preserving the aggressors, like insects and harmful microorganisms of the fruits. This would mean that besides good post-harvest practices, no other effective means exists to annihilate these fruit aggressors. Because the lack of conservation means is a handicap in the fight against fungal alterations (especially sporulated forms of mold).

The vast majority of producers don't know the harmful effects of microorganisms on the alteration of pineapple fruit. This could be explained by the high rate of illiteracy recorded among them. This ignorance could also fall to the technical management structures which do not fully play their role as trainer of producers. Thus, extensive producer training campaigns should be launched by the managers of the sector. Production can only be of quality if the producers themselves are of good quality, that is to say well trained and conscientious.

This study also showed that the marketing of pineapple fruits in the Abidjan markets is essentially devoted to women. This observation is in line with that of Onuorah (2013) who reported that the marketing of fruit in African markets is an activity mostly practiced by women. This could be explained by the fact that this activity is considered as a female task as much as domestic tasks. According to Yiriwa, (2001) [27], fruit sales are an income-generating activity for many urban women. One of the main reasons supporting the practice of this informal activity in these women would certainly be the lack of employment. According to Dieye (2006) [13], this informal activity is proving to be an important factor in the food security of urban populations and the creation of jobs for vulnerable groups.

The survey revealed a low level of education among pineapple fruit sellers. The low level of education of sellers in markets may be due to the fact that selling fruit is an activity that does not require special skills. This partly justifies the strong representativeness of those not enrolled in this informal sector. This assertion supports the report of Boli et al. (2016) on the processing and marketing of Mostly dominated by low-educated women. In addition, Baba and Ehui, 2008 [5] reported that in Ivory Coast, in the informal sector, it is the experience gained on the ground that counts for most women to emancipate themselves economically and realize gains capitalized.

This study also showed that the sale of fruit in the markets of Abidjan regressed with the age of the sellers gradually in time. One of the main reasons for the decline in this activity is due to the replacement of these sellers by persons close to whom they learn the business of trade for the succession in time. In urban areas, the majority of female food processors and food sellers are supported by their daughter as a priority and then other family members (nieces, sisters and cousins) who replace them later.

The main areas of supply of pineapple fruits in Ivory Coast were the Southern and South-Eastern areas, confirming the work of Guyot et al. (1974). Indeed, these authors have indicated that the main areas of pineapple production in Ivory Coast are those covering the whole Southern and South-Eastern part of the country from which supplies are made to large cities, especially Abidjan. The fruits marketed in the markets of the various municipalities are largely produced in Bonoua. This could be explained by the fact that Bonoua was long and remains the stronghold of the pineapple culture [12].

The investigation revealed that the fruit is sold for a period of 2 to 3 days at room temperature until the stock is exhausted. This short period

of fruit sales can be explained by the intrinsic characteristics of the fruit. Indeed, the fruits received are showing signs of alterations after a period of three to four days. A long period of sale could be a source of fruit contamination, including fungal contamination and mycotoxin production. Indeed, according to Barro et al. (2006) [6], the risk of fruit contamination increases with long-term marketing due to poor practices and manipulation. In addition, according to other authors [14, 20], poor storage and storage of fruits within stores contribute to contamination by aflatoxins and pathogenic fungi.

The majority of sellers do not protect the fruits during the sale in the markets. Indeed, according to the latter, the exposure of fruits during the sale allows customers to see them from a distance. This means that fruits are permanently exposed to the open air During marketing in the markets. According to Koffi-Nevry et al. (2012) [21], the immediate environments of sales outlets in the marketing markets of Abidjan are real sources of contamination of all kinds. According to the same authors, various sources of contamination in or near the markets include flies, water points on cemented soil, sewers, public toilets, garbage dumps or open channels. In addition, pineapple fruits are sold close to other fruits and other foods in markets. Fruits are often the destination of flies (potential reservoirs of pathogenic microorganisms) from the surrounding pollution sites as reported by (Koffi-Nevry et al., 2012) [21]. Also, the mode of exposure of fruits during sale could attract flies and be a determining factor in the spread of many foodborne diseases.

CONCLUSIONS

This study of the Bonoua, Tiassale and Dabou producers shows that post-harvest practices are poor in most cases and are similar in all these areas. Thus, harvesting which is manual can lead to a contamination man ported. Bulk packaging results in shocks and bruises that are entryways to microorganisms. Also the absence of means of conservation is a notable fact. All these practices can have a consequence both on the quality of the fruits and on that of the finished products that result from them. This study made it possible to identify the factors of risk of alteration of the fruits of pineapples. Poor hygiene practices and conditions for the sale of pineapple fruits are the main factors of alterations.

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ASSESSING THE COMPETITIVENESS OF FARMS IN LITHUANIA

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Abstract

The aim of this paper is to present the competitiveness of the Lithuanian farms. To determine the farm competitiveness level it was used the competitiveness index. The paper proposes an economic analysis of farms and their competitiveness according to their size in the period 2011-2015. The measurement was made at the farm level and the data of Lithuanian Farm Accountancy Data Network (FADN) was employed. This analysis revealed that Lithuanian farms in the group of 20-<30 ha and farms in the group of 40 ha and larger in 2011-2015, except some years, demonstrated the competitiveness. But it was indicated the lack of development abilities of farms' up to 20 ha and 30–<40 ha over all the analysed period.

Key words**:** *competitiveness, farm, index*

INTRODUCTION

In the literature different definitions of competitiveness and no generally– accepted theoretical framework exists [3, 14]. There is no consensus in theories regarding the definition and measurement of competitiveness –either in general, or specifically in agriculture [5, 9]. Competitiveness can be defined as the ability to face competition and to be successful when facing competition. Competitiveness would then be the ability to sell products that meet demand requirements (price, quality, quantity) and, at the same time, ensure profits over time that enable the firm to thrive. Competitiveness is a relative measure [8]. There is a profusion of definitions with studies often adopting their own definition and choosing a specific measurement method.

The primary analysis of the literature of agriculture competitiveness revealed that measurement concepts are market share [1, 3, 13], productivity [2, 7, 8, 10, 11, 12], economic performance indicators [8]. According to K. Sachitra (2017) crucial components of competitiveness are productivity, market share, and profitability are traditional economic indicators which are seen as inadequate to measure competitive advantage at the firm level. According to C. Fischer et al. (2007) competitiveness may be seen as a function of two indicators: profitability and market shares as relevant competitiveness. Market share of a particular product is considered as an indicator to measure the competitiveness of a firm or industry [13]. There are many components of competitiveness of agricultural enterprises and they can be divided into different categories. One of them includes resources based factors. Traditionally in agriculture resources are linked with production factors such as: land, labor and capital [9].

In this research to determine the farm competitiveness level it was used the competitiveness index, which concept was proposed by R. Gallardo et al. (2002) and used by W. Kleinhanss (2014) in measurement of farms competitiveness in Germany. The index express the relation of income (Farm Net Income – FNI) and the opportunity costs of fixed factors owned by given farm (family labour, owned agricultural land and capital), in this study the formula was applied for Farm Net Value Added (FNVA) and denominator was extended by costs of external factors for hired labour, rented land and paid interest.

MATERIALS AND METHODS

The purpose of this research is to identify competitiveness of farms in Lithuania in 2011–2015. Competitiveness level shows the ability

of farms to develop. Farms generate income optimizing their activity under given (and future) economic, where output (prices), inputs and governmental transfers play the main role [6]. If income is greater than factor costs, farms are able to compete and stay in business, have ability to develop; otherwise they could try to adjust or go out of this activity and use the factors in other one. For the assessment of farms competitiveness the formula was used:

$$CI = \frac{FNVA}{OCF+OSL+OCC} \begin{matrix} > \\ = \\ < \end{matrix} 1$$

Where:

CI – Competitiveness Index of farm;

FNVA – Farms Net Value Added.

OC – opportunity costs of farm's fixed factors:

OCF – the costs of family and hired labour (the costs of family labour was measured as cost paid for hired labour in the same group of farm size);

OCL – owned and rented agricultural land (the costs of farm's owned agricultural land was measured as rental fee of land rented in the same group of farm size);

OCC – owned capital and interest paid (the costs of farm's owned capital was measured as interest rates (excluding land)).

When the CI>=1 it means that farm has full remuneration of owned and external factors and when CI<1 it means a partial remuneration of owned and external factors.

The measurement was made using FADN data on the period covered 2011–2015. Whether small farms perform better than large farms is still the topical question [8]. The effect of farm size on economic performance is investigated using various indicators of size, since there is no consensus on the best measure for size in agriculture. Indicators used include: total output produced; utilised agricultural area (UAA); herd size or number of cows or pigs; European Size Units; farm value added; labour used or assets and real productive capacity based on rental rate. In this research farms competitiveness is investigated using UAA (ha) indicator of size. According to UAA we use 8 groups of farms (<10 UAA, 10–<20 UAA, 20–<30 UAA, 30–<40 UAA, 40–<50 UAA, 50–<100 UAA, 100–<150 UAA, >=150 UAA).

RESULTS AND DISCUSSIONS

Farm economics performance

Productivity is a basic and intuitive measure of performance. In the competitive world, productivity is one of the key success factors [11]. FNVA main advantage as an indicator for measuring income developments lies in its relative simplicity. To account for differences in farm size FNVA is usually expressed per annual work unit (AWU), which can be seen as a measure of partial labour productivity. The average FNVA of Lithuanian farms increased by 12.7% from 2011 to 2015, mostly due to increases in agricultural output and prices. Compared to 2015, FNVA was higher just in 2012 – 14.1%. Average FNVA per AWU in the analysed period increased by around 14.9%. This slight increase was driven by the increase in FNVA, with labour input reduced by 4.7%. It was primarily influenced by an increase in agricultural output prices. The average income per AWU in farms under 50 ha remained significantly below than the gained income in all farms. The average income per AWU gained by Lithuanian farms in the group of 150 ha and larger in the period of 2011–2015 was even up to 9 times higher than in these of size up to 50 ha (Fig.1). The higher income is one of the factors which improve the level of farms competitiveness and their ability to develop.

Fig. 1. Farm net value added per AWU by farm size in 2011–2015 (EUR)

Source: Own calculation on the basis of data from FADN data base 2011–2015.

In the FADN survey, the average number of workers employed per farm in Lithuania stood at average 1.9 AWU in 2011–2015. However, the figure varied across farms by their size, average in 2011–2015 ranging from 1.5 AWU in farms under 30 ha to 2.1 AWU in farms

group of 100–< 150 ha and 3.6 AWU in farms group of >= 150 ha. A significant part of the labour force employed in agriculture is family labour. Family labour as a proportion of total labour represents the prevalent form of labour in most farms with the exception of largest farms in group of >=150 ha. As Fig. 2 shows, the average proportion of paid labour in the total labour force in 2011–2015 in this group was 62.8%. The share of own labour dropped along with a growth in size of farm. In the class up to 40 ha there was at least 60% share of own labour in total labour inputs. For the farm abilities to compete it is seen that the cost of labour (paid and unpaid) per UAA was highest in smallest (<10 ha, 10–<20 ha) and largest farms (100–<150 ha and >=150 ha). This reflects smallest farms have the higher values for paid and unpaid labour than average in all farms and generate less FNVA per AWU, that in turn lead to their competitiveness level decline.

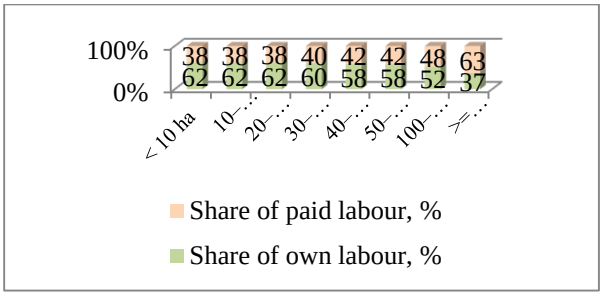

Fig 2. Proportion of labour input in 2011–2015 (paid and unpaid labour)
Source: Own calculation on the basis of data from FADN data base 2011–2015.

For most farm types access to agricultural land is a precondition for economic activity. Fig. 3 shows the ownership of agricultural land. The share of rented land shows an upward trend along with a size of farm (in UAA). However, the cost of land rented varied across farms by their size, average in 2011–2015 in the smallest farms group (under 10 ha) and in the largest farms group (>=150 ha) more than 20 percent higher and in farms group by size 30–<40 ha 22 % lower than the average in all farms.
The value of assets per AWU correlated with the size of farm. Asset value in farms in the group of <=150 ha was highest – 4.9 times higher than in farms under 30 ha. The differences were not so varied among farms by size under 30 ha. In the remaining classes it included in the range from EUR 23.2 thou. per AWU (<10 ha) to EUR 29.7 thou. (30–<40), as compare to farms size 50–<100 ha value of assets was EUR 132.0 thou.

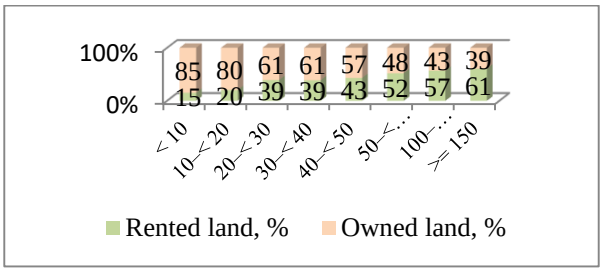

Fig. 3. Average level of ownership of agricultural land average in 2011–2015
Source: Own calculation on the basis of data from FADN data base 2011–2015.

The proportion of subsidies in total revenue varied across farms by their size. The relation of subsidies to farm total revenue amounted to as much as 8% in farms <10 ha, 17% in farms 10–<20 ha and 17% in farms >=150 ha, in others – more than 22%. A significant part of subsidies was in farms 30–<50 ha (=<30%).

Assessment of competitiveness

Assessment of competitiveness of the farms in Lithuania (Table 1) showed that farms' up to 20 ha and 30–<40 ha competitiveness index was below 1 in the period 2011–2015. It indicated the lack of development abilities; they had a partial remuneration of owned and external factors. The measurement confirmed the farms from 40 ha reached competitiveness level =>1, which means that farms has full remuneration of owned and external factors.

Table 1. The competitiveness index by farm size in 2011–2015

Period	< 10	10–< 20	20–< 30	30–< 40	40–< 50	50–< 100	100–< 150	>= 150
2011	0.68	0.87	1.32	0.93	0.90	1.34	1.27	1.49
2012	0.48	0.66	1.37	0.83	1.05	1.25	1.48	1.77
2013	0.40	0.97	0.97	0.58	1.02	1.12	1.03	1.15
2014	0.48	0.28	1.01	0.75	1.17	0.85	0.83	0.88
2015	0.83	0.52	1.07	0.69	0.77	1.13	1.07	1.12

Source: Own calculation on the basis of data from FADN data base 2011–2015.

As competitive farms can be considered farms in the group of 50 ha and larger (except in 2014), 20–<30 ha farms (except in 2013) and farms in group of 40–<50 ha in 2012–2014.

The analysis indicated the lack of competitiveness of the farms up to 40 ha, except these of 20–30 ha. The farms in the croup of 50–<100 ha, 100–<150 ha and =>150 ha failed to reach competitive level in 2014 because of lower total output, higher intermediate consumption and depreciation than the average over the period 2011–2015.

CONCLUSIONS

The average income per AWU gained by farms in the group of 150 ha and larger were up to 9 times higher than in farms size up to 50 ha. The share of own labour dropped along with a growth in size of farm. The cost of labour per UAA was highest in smallest (up to 20 ha) and largest farms (100 ha and larger).

The share of rented land showed an upward trend along with a size of farm. The cost of land rented varied across farms by their size, average in 2011–2015 in the smallest farms group (under 10 ha) and in the largest farms group (>=150 ha) was more than 20 % higher and in farms group by size 30–<40 ha 22 % lower than the average in all farms.

The value of assets per AWU correlated with the size of farm. Asset value in farms in the group of <=150 ha was highest – 4.9 times higher than in farms under 30 ha. The differences were not so varied among farms by size under 30 ha.

It was indicates the lack of development abilities for small farms in Lithuania. Competitiveness index of the farms' up to 20 ha and 30–<40 ha was below 1 over all the analysed period; they generated less FNVA per AWU, had the higher values for paid and unpaid labour than average in all farms and. In farms of 20–30 ha was generated a greater FNVA per AWU under almost the same labour, land and capital resources costs as in other up to 40 ha size farms, this confirmed them to be able to compete.

The measurement confirmed the farms from 40 ha have full remuneration of owned and external factors. As competitive farms (except some years when they failed to reach competitive level because of lower total output, higher total intermediate consumption and depreciation than the average over all period) can be considered farms in the group of 50 ha and larger, 20–<30 ha farms and farms in the group of 40–<50 ha in 2012–2014.

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ALTERNATIVE FOR PROTEIN CONCENTRATIONS OBTAINED FROM EGG WHITE BY COLD DRYING

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Abstract

This paper presents an alternative method to dry white eggs. Because on thermal treatment the protein denaturation is relatively high, cold drying of the white eggs maintains intact the protein chain. Eliminating the air heating from classic technology will conduct to energy reducing during the process. Also, all products, made of the white egg powder obtained using cold draying, will have complete proteins in amino acids.

***Key words*:** *protein, egg white, cold dry*

INTRODUCTION

Drying is one of the oldest unitary operations, it is the operation that reduces the water content. Drying is achieved until the storage moisture content of the product is reached.

Drying is accomplished by evaporating the water which gradually reaches the surface of the product to be dried to aw <0.7 which prevents the development of microorganisms [12].

Natural materials and manufactured products contain variable proportions of moisture, coming from contact with liquid water or atmospheric vapors [11].

Drying is the operation by which water from solid or liquid materials is removed by air, which has a double role: to bring the heat needed to vaporize the water and to evacuate the resulting water vapor by heating [1,6].

The main reason for drying the food is to extend the shelf life. Also, the enzymatic activity and the speed of unwanted reactions are reduced accordingly.

The main methods of dehydration are: natural drying, directed dehydration in special installations at normal pressure, fluid bed dehydration, vacuum concentration, lyophilization (cryodication or cryosublimation) [8,13].

The most modern methods are fluid bed dehydration and lyophilization, the latter ensuring the rehydration capacity, preventing oxidative processes and reducing the smell, taste and aroma to a lesser extent [2,9,10].

Dehydrated products have a reduced volume, lower weight, increased energy value, are easy to prepare, save on storage and storage, are easy to handle and transported, but lose some of the aromatic substances and partially destroy some vitamins [5].

Pre-fluidized food products are dehydrated by two methods: pellicular and spray or powder atomizer (egg powder, powdered milk, etc.).

White egg consist almost entirely from water (78%) and protein (11-12%). To this is added reduced amounts of fat (0.2%), carbohydrates (0.9-1.9%), mineral salts, enzymes and vitamins.

With proteins of high nutritional value, dehydrated egg white can successfully replace milk protein concentrates widely spread in the market.

Moreover, the process proposed in this paper reduces production costs and, implicitly, the price of the final product.

Also, in the absence of oxygen in a cool storage environment, powdered eggs have a storage life of 5 to 10 years [13]. Consequently, in the absence of yolk, the shelf life is even more guaranteed.

MATERIALS AND METHODS

The device is made up of two vertically connected compartments communicating with each other through two end slots.
The lower compartment includes the fans and the support on which the white is dispersed.
The upper compartment is identical in shape to the lower one, with the difference that at the extremities there are two transverse slots allowing the passage of the air flow [3].
At its bottom, there is a grate that holds the silica gel powder adsorbent layer compact.
Principally, as seen in Fig. 1, the operation of the apparatus is based on forced air circulation through the two compartments.
The three fans, arranged to transversely cover the whole section of the lower compartment, take up the air passing through the corresponding slit in the upper compartment, and direct it to the egg white to be dehydrated.
This is amplified by the inclined arrangement of the fans so that the air currents move to its surface, vaporizing superficially water from the surface of the white layer.
This vaporization has therefore the water flow from the base of the layer to the surface.
The air whose relative humidity increased by taking up a quantity of water from the surface of the white leaves the lower compartment [7] through the slot opposite the one that feeds the fans and penetrates the upper compartment [4].
Here the air currents will move sharply with the silica gel layer due to the positioning of the slots at the base of the compartment.
Humidity taken over by the air will be adsorbed by silica gel.
The dry air will continue its movement by resuming the circuit.

RESULTS AND DISCUSSIONS

Sizing device calculation

In the sizing calculation, 100 cm^3 of workmanship shall be considered.
pound = 1.03 g / cm3

Dissipation surface:

$$Ssp = 21 \times 29.7 = 623.7 \text{ cm}^2$$

For 100 cm^3 of egg white, the height of the layer is:

$$hrs = 100 / 623.7 = 0.16 \text{ cm}$$

The amount of water in 100 cm^3 of egg white:

- 100 g of white contains 88 g of water
- 100 cm^3 contains lighter x 88 = 1.03 x 88 = 90.64 g water

Theoretically, 100 g of egg white yields 12 g of dry white
Considering that silica gel has a high after adsorption capacity of up to 35-40% of its own dry mass, it was considered that to extract 88 g of water from the egg white dissipated on the support of 623.7 cm^2 is need:
dry white oil = m white/0.35 = 90.64/0.35 = 258.97 g
Standard silica gel has an apparent density of 730 kg/m^3 (0.73 g/cm^3)
The volume of silica gel required to adsorb 88 g of water is:
Dry silica gel = 258.97/0.73 = 354.75 cm^3
Necessary absorption area considering the dissipate layer thickness of max 0.5 cm:
Sabosorption = 354.75 x 2 = 709.51 cm^2
For air circulation, 3 Evercool EC9225HH12X (Figure 2), fans are coupled to a speed variator for airflow control.
The fan parameters are:
Number of rotations: 3,000 rotations/minute
Voltage: 12 V
Intensity: 0.3 A
Air flow rate: 1.7 m^3/min

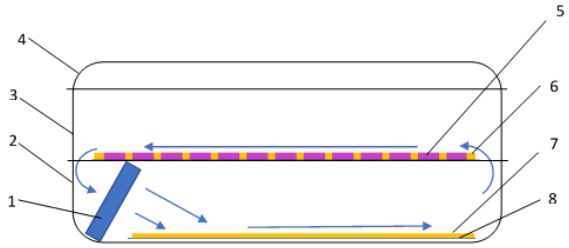

Fig. 1. Scheme of adsorption desiccation system in silica gel
Legend: 1. Ventilator;
2. The lower body of the appliance;
3. Upper body;
4. Cover;
5. Silica gel;
6. Uniform grid distribution of silica gel;
7. Eggplants;
8. Flexible support.

Three drying processes at 24 °C (laboratory ambient temperature) and 3 freeze-drying processes at 5 °C of 100 cm^3 of egg white were performed.

The relative humidity at the air intake air gap was measured at the fans. The drying times are presented in Table 1.

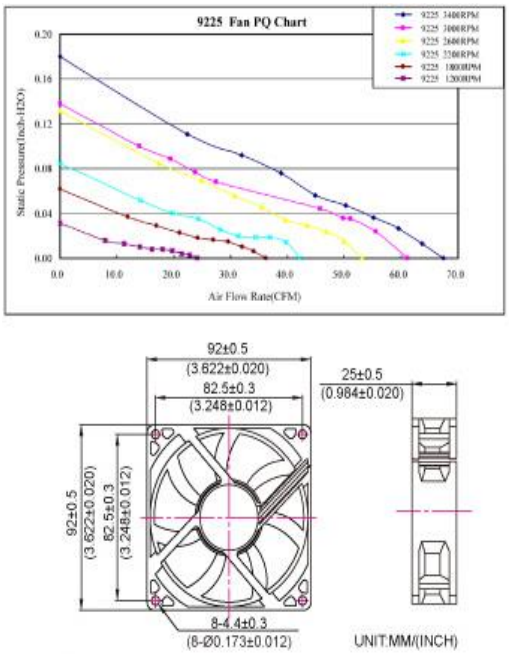

Fig. 2. Evercool EC9225HH12X

Table 1. Drying times correlate with working temperatures

Temperature [°C]	Drying 1 [min]	Drying 2 [min]	Drying 3 [min]
24	65	68	66
5	59	58	60

Dehydrated albumin was obtained by scraping the support on which the white was dispersed. The theoretical amount of dehydrated egg white is 12.36 g.

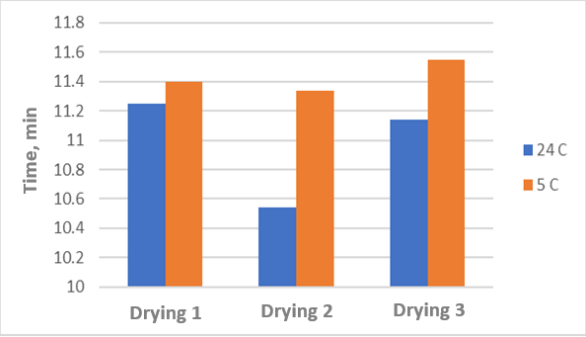

Fig. 3. Dehydration time

Table 2. The amount of dewaxed white powder obtained

Temperature [°C]	Drying 1 [g]	Drying 2 [g]	Drying 3 [g]
24	11.25	10.54	11.14
5	11.4	11.34	11.55

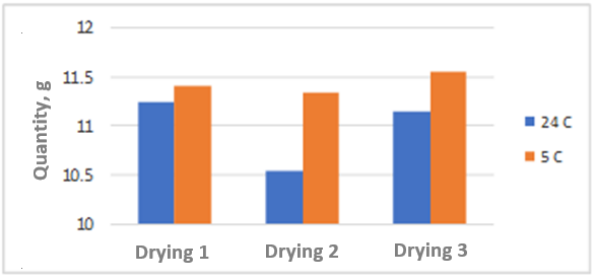

Fig. 4. The amount of dewaxed white powder obtained
Source: Kudra, T., & Mujumdar, A.S. (2001). Advanced drying technologies. Marcel Dekker Inc. New York

CONCLUSIONS

The technology based on fluid bed dehydration due to the use of high temperatures for dehydration leads to protein denaturation.
The process presented in this paper prefers this, the whole process taking place at low temperatures.
Based on the experimental data and the model presented, an industrial high-capacity drying plant can be dimensioned.
There were no references to the exhalent of a configuration like that presented in the paper.
The experiments were carried out on white chicken. The following research will also target other bird species.
Also, the degree of denaturation of proteins in both the oxygen atmosphere and in different gases that do not affect the protein structure should be evaluated.

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THE INFLUENCE OF THE PARAMETERS AND THE WORKING MODE ON THE QUALITY OF THE FINISHED PRODUCT IN THE MANUFACTURE OF SUGAR BISCUITS

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Abstract

The paper studied the influence of the working parameters, the order of introduction of the ingredients in the dough and the way of working on the quality of the finished product in the production of sugar biscuits. The procedures for manufacturing, handling and packaging of sugar biscuits are described. The paper explains in general terms what the biscuit manufacturing involves from raw material dosing to the storage of the finished product. Sugar cookies have been designed to meet current market needs, consumers, and for this purposethey have specifications for product quality, packaging size, appearance, types and quantities of ingredients. These specifications define the limits and it is the task of the production department to ensure that only the biscuits that meet the specifications are packaged and sold. Any inappropriate product is eliminated in other ways and will represent a financial loss for the producing companies.

***Key words*:** *sugar biscuits, ingredients, fat*

INTRODUCTION

To make the sugar dough, it is needed to use the sigma-arm mixer. The hygienic condition of the mixer before introducing the raw and auxiliary materials and sanitize is necessary. The raw materials are introduced according to the working method specified in the recipe, considering the temperature of the raw material, the dosage, the preparation of the raw material, the ingredients of the ingredients and the mixing time [4].

The temperature of the raw material influences the consistency of the dough. The raw materials to which the temperature specified in the recipe is to be observed are: palm vegetable fat and water. The temperature ranges are recited in the working mode.

Dosage is more than important for making any product. Any overdosing/underdoing has noticeable effects on the operation of the production line and the quality of the product. Dosage of the raw material, the specified quantity of which in the recipe is less than 15 kg, is made on scales with an accuracy of 5 grams and, over this quantity, the weighing scale is used [5].

Preparing the raw material which requires a pre - training.

The placement in the mixing bowl is in the following order of the ingredients: palm vegetable fat, water, chemical livers and cinnamon.

Palm plant fat requires a special temperature as specified in the recipe. If the temperature is not within the set range, the dough consistency will change [1].

Chemical dusts is dissolved in water. In the container in which dosing is made, dissolution is also carried out. Add a quantity of water from the total amount of water in the recipe and mix with the hand.

Cinnamon is mixed with the amount of sugar that is added in the first stage to the assortment to which it is used.

The raw material input order influences the dough processing on the forming part and the size of the finished product. Follow the order of feedstock and the two or three phases, depending on the assortment manufactured, as specified in the recipe [3].

The kneading time is set and passed into the manufacturing recipe. Failure to comply the

mixing time influences the consistency of the dough.

The dough temperature at the end of the kneading will be 25 ± 2°C. The dough cups must be ignited both at the start of manufacture and at stopping and will be kept clean. At the end of the work the mixer will be ignited [2].

MATERIALS AND METHODS

Sample I

Phase I: Water soluble dishes (Tapa=40 ± 3°C) together with palm vegetable fat at temperature=40-42°C and the rest of the raw materials, less the flour and 30% of the total amount of sugar, are placed in the mixing bowl and the kneading starts. The kneading time is 9 minutes.

Phase II: Insert the flour and the rest of the sugar and continue the kneading for another 3 minutes.

Sample II

Procedure

Phase I: Watermelons dissolved in water (T_{water} = 40±3 °C) together with the palm vegetable fat at temperature = 38-40 °C and the rest of the raw materials, less the flour and 30% of the total amount of sugar, are placed in the mixing bowl and the mixing is started. The kneading time is 9 minutes.

Phase II: Insert the flour and the rest of the sugar and continue the kneading for another 3 minutes.

RESULTS AND DISCUSSIONS

This change has influenced a range of parameters both at the biscuit formation area and the finished product. In the dough with fat = 46-48 ^oC, the temperature being well above the melting point (39-40 ^oC), the dough was fatter, the fat liquefied which influences the structure of the dough and finally the quality of the finished product.

Coming with a higher inlet temperature, a dough with a higher temperature (29-30 °C) resulted in a complicated machining and adherence on the working parts of the machinery.

The difference in weight, diameter and thickness were most affected.

The temperature of the palm plant fat has changed with a decrease of approximately 80 °C, compared to the actual recipe.

The melting point of the palm plant fat used in this product is 39 ^oC.

The dough temperature and humidity are monitored after kneading.

In the training area the diameter, the weight of the dough piece after its output from the alveoli is monitored.

If the piece of dough is below the proper weight, it will work on the machine to reach the desired weight.

After baking we will follow the technological parameters: diameter, thickness, weight, humidity, to control the quality of the manufactured product.

Table 1. Recipe for biscuits with honey and cinnamon

Crt. No.	Material	MU	Amount	Working modeling
1.	Palm vegetable grass	kg	0	
2.	Caramel syrup	kg	0	
3.	Granulated sugar	kg	0	
4.	Glucose-fructose syrup	kg	0	
5.	Ammonium bicarbonate	kg	0	**Phase I** 9 Min
6.	Sodium bicarbonate	kg	0	
7.	Salt	kg	0	
8.	Cinnamon	kg	0	
9.	Apple flavor	kg	0	
10.	Honey	kg	0	
11.	Water	kg	0	
12.	Granulated sugar	kg	0	**PhaseI** 3 Min
13.	Flour type 650	kg	0	

Table 2. Comparison of parameters with change of fat temperature

Technological parameters	Alveole dimensions	T_{fat} = 46-48^oC	T_{fat} = 38-40^oC
Diameter	43 mm	50-53 mm	44-45 mm
Thickness	3.8 mm	6-6.2 mm	5.2-5.4 mm
Weight	5g/buc	6.4-6.7 g	5-5.2 g

The order of sugar granulated intake was changed, where the sugar in the first kneading phase was introduced 70% of the amount and in the second phase 30%:

Table 3. Comparison of parameters with change of order of sugar introduction

Technological parameters	Alveole dimension	Phase I - 100% sugar	Phase I – 70 % sugar Phase II – 30 % sugar
Diameter	43 mm	47.5-49 mm	44-45 mm
Thickness	3.8 mm	5.5-5.7 mm	5-5.2 mm
Weight	5g/piece	4.5-4.7 g	5-5.2 g
Hardness		low	high

Baking times are generally longer, as lower temperatures are required to prevent excessive coloring.
Baking time is related to the thickness of biscuits, and sugary biscuits can be very thick and are generally thicker than other types. Baking profiles are usually flat at about 180 ° C for all furnace areas.

Photo 1. Phase I (orig.)

During the cooling of the biscuits, in addition to lowering the temperature, humidity also changes.
A uniform distribution process takes place in the mass of biscuits by migrating the vapors from the center layers to the outer layers. The end of this temperature change takes place after about 30 minutes and depends on the thickness of the biscuits and the temperature, and possibly on the cooling air speed [7].
It is recommended that during the cooling, the biscuits are kept in a space or area where the air temperature is at most 30-40^{0}C, humidity 70-80%, and air velocity of 2.5 m/s, the air being directed the countercurrent with the displacement of biscuits [6].

Photo 2. Phase II (orig.)

CONCLUSIONS

The objectives of this work, research have been achieved fully. We have succeeded in offering a new, quality and safe product to consumers. We have succeeded in bringing it to the parameters proposed by the company, the consumers, by us. We have found the best solutions to make this product to correspond both to the qualitative and quantitative standards.
We can see how much an ingredient plays, the processing temperature and how it works to produce compliant products.
Therefore, products rich in fat and sugar have less water in the dough. This means that the protein is imperfectly hydrated to form gluten and when the dough is heated there is not enough water to gelatinize much of the starch. The structure is based more on a sweet or caramelized matrix that becomes softer than it sets with the rise in temperature. Thus, during the baking of short sugar-rich doughs, an expansion is observed in all directions, followed by an increase in thickness. The spread of the dough and the growth are responsible for the cracked surface of the biscuits.

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FACTORS INFLUENCING PERFORMANCE OF NATIONAL DIRECTORATE OF EMPLOYMENT AGRICULTURAL GRADUATE FARMERS IN IMO STATE, NIGERIA

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Abstract

This study analyzed factors influencing performance of National Directorate of Employment Graduate farmers in Rural Agricultural Development Training Scheme of Imo State, Nigeria. A multi-stage random sampling procedure was used to select 90 (45 cassava and 45 poultry farmers). Data were collected through a structured questionnaire and analyzed using descriptive statistics such as frequencies, percentages, mean counts. Return on Investment and multiple regression models. The result from the study showed that 57.78% of the farmers were males with mean farming experience of 14 years and farm size and flock size of 1.5 hectares and 90.5 birds respectively. The result also shows that incomes from cassava and poultry farming were ₦325,500.00 and ₦421,400.00 respectively. Cassava and poultry production enterprise was a lucrative business with a Return on Investment (ROI) of 142.40%.and 138.40% respectively. The multiple regression analysis result revealed that coefficients for age, marital status, household size, farming experience, flock size, crop output and poultry output influenced performance of cassava and poultry farmers' performance. It is therefore recommends proper funding of the scheme, awareness and sensitization of the programme agricultural activities and monitoring of graduate farmers for effective performance of their farming activities.

Key words: *factors, cassava, poultry, graduate farmers, NDE*

*1USD = 175 NGN (Nigeria Naira) at the time of the research

INTRODUCTION

Nigeria is faced with many desperate job seekers from various secondary and tertiary institutions. However, these individuals are susceptible to frustration as a result of lack of job opportunities within which they can begin to feed themselves. Above all, there are no jobs, and for those who are employed, retrenchment cruelly stare them in the face [17]. There is increase in population and geometrical increase in youth population with an attendant low or zero employment for the learning youths of the Nigerian society. This situation is particularly prevalent in the rural areas eventually leading to rural-urban migration of the youths. It is a chain event that leads to low level of food production and under development of the population [16]; [8]. With fewer youth into agriculture, the long-term future of the agricultural sector, the present poor state of decline in agricultural production has dimmed the hope of raising its level to ensure sustainable food security for the ever increasing population of Nigeria [5]; [13].

Agriculture is a necessity for the growth and development of any nation. [2] opined that many factors contribute towards the development of agriculture in Nigeria. In many developing countries, efforts at agricultural progress have failed because of inadequate attention to one or more components of successful policy and thus over the years reduced agriculture revenue generation. [3] reported that in Nigeria, Africa's most populous country, a legacy of sharp practices and an economy based primarily on oil exports has left the agricultural sector significantly weakened and millions of Nigerians hungry.

World Food Monitoring Report indicated that Nigeria has consistently maintained the leading position as world largest producer of cassava in recent years. Annual production record of cassava in Nigeria stands at about 38.7 million metric tons [9]. This achievement is largely due to availability of improved varieties of

cassava from National Root Crops Research Institute (NRCRI) Umudike and International Institute of Tropical Agriculture (IITA) Ibadan, all in Nigeria. These improved varieties were developed to boost the productivity of cassava [18]. The poultry sector in other hand globally is highly dynamic, particularly in developing countries that are evolving in response to rapidly increasing demand for animal products. Poultry production and consumption has increased in the world [23]. Poultry meat accounts for about 87% chicken and 6.7% Turkey of the global meat consumption [8]. [13]; [6], report that the major contribution of poultry consumption in improving *per capita* nutrients level is well documented; however, further improvement would be possible by encouraging the unemployed to venture into the business and improving the profitability of producers through up-taking of poultry technologies.

Over the years Nigerian government has introduced and implemented several policies and programmes aimed at revamping the agricultural and poverty alleviation or reduction programmes meant to reduce the level of poverty, give hope and succour to the poor and/ or move towards some sort of wealth creation [20]. However, evidence suggests that the key to alleviating poverty in many parts of the world is a more productive and profitable agricultural sector. This is because agriculture paves the way for economic growth in poorer nations, through income distribution and building of a sustained economic growth through development agencies [25].

Attempt at reducing the rate of unemployment in Nigeria especially among youth necessitated the establishment of National Directorate of employment (NDE), in recognition of the role agriculture can play as a spring board for employment generation and self-sufficiency in food production. The Rural Agricultural Development and Training Scheme (RADTS) were established to train unemployed youths in agricultural production [17]. It is not yet ascertained since the commencement of scheme in the state, whether performance of agricultural mandates has been achieved through cassava and poultry farming. It is against this backdrop that the paper analyzed factors influencing performance of Graduate farmers of Rural Agricultural Development Training Scheme of National Directorate of Employment in Imo State, Nigeria.

The specific objectives were to:

(i)describe the socio-economic characteristics of the NDE graduate farmers

(ii)determine the performance of cassava and poultry NDE agricultural graduates in the scheme; and

(iii)determine factors influencing performance of the graduates in cassava and poultry farming

MATERIALS AND METHODS

The study was carried out in Imo State. The state lies within latitudes 4º 45'N and 7º 15'N, and longitude 6º 50'E and 7º 25'E. It occupies the area between the lower River Niger and the upper and middle Imo River. The state is bounded on the east by Abia state, on the west by River Niger and Delta state; and on the north by Anambra State, while Rivers state lies to the south. The state is located within the rainforest belt of Nigeria, and the temperature ranges between 20º C and 30º C. Agriculture is the major occupation of the people. The major food crops produced include cassava, yam, cocoyam, maize, and melon. Imo state is made up of 27 Local Government Areas (LGAs) and three Agricultural zones of Okigwe, Owerri and Orlu. The NDE beneficiaries were chosen from the list of trained beneficiaries of Rural Agricultural Development and Training Graduates of NDE. A multistage random sampling technique was used to select LGAs and respondents. First, six (6) local government areas namely Owerri North, OwerriWest, Isiala Mbano, Orlu, Ezinihitte Mbaise and Ohaji/Egbema, out of twelve (12) LGAs where the programme was located were randomly selected for the study. From the list, fifteen (15) practicing agricultural graduate trainees were randomly selected from six (6) Local government Areas giving a total of ninety (90) respondents. Data were analyzed by the use of descriptive statistics such as frequency distribution, percentages, means and

tables, Return on Investment Analysis and multiple regression analysis.

Model Specifications

(A)The Return on Investment was used as proxy for performance of the trainees. The R.O.I. model gives profitability as a measure of the Rate of Investment. It expresses net revenue as a percentage of total investment. According to Ibeagwa *et al*. (2012), the model is shown below:

Return on Investment (R.O.I) =

$$\frac{\text{Net Revenue per annum}}{\text{Total cost incurred per annum}} \times \frac{100}{1}$$

The Net revenue is given by Total revenue - Total cost

where:

Total cost = Total variable cost + Total fixed cost

Beneficiaries with ROI higher than 50% were considered to be performing well. Those with ROI below 50% were considered poor performers.

(B)In determining factors influencing the performance of cassava and poultry farmers in the scheme multiple regression analysis was used.

The four functional forms of regression model viz: linear, semi-log, exponential and cobb-Douglas were employed, The best fit was chosen as the lead equation based on its conformity with econometric and statistical criteria such as the magnitude of R^2, F-ratio and number of significant variables.

The function is specified as

$Y = f(X_I, X_2, X_3 \ldots\ldots\ldots\ldots\ldots X_{8+} e_i)$.

The four functional forms are expressed as follows:

Linear Function

$Y=b_0+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6+b_7X_7+b_8X_8+ b_8X_8+ +ei$

Semi – log function

$Y=L_nb_0+b_1L_nx_1+b_2L_nx_2+b_3L_nx_3+b_4L_nx_4+b_5L_nx_5+b_6Lnx_6 +b_7Lnx_7+b_8Lnx_8+ ei$

Exponential function

$LnY=b_0+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6+b_7X_7+b_8X_8 +ei$

Cobb Douglas Function

$LnY=L_nb_0+b_1L_nX_1+b_2L_nX_2+b_3L_nX_3+b_4L_nX_4+b_5L_nX_5+b_6L nx_6+b_7Lnx_7+b_8Lnx_{8+} ei$

where,

Y = Performance (Return on Investment) (₦)

X_1= gender (male = 1, female = 0)

X_2= age (years)

X_3= marital status (married =1, otherwise=0)

X_4 = education level (number of years spent in school)

X_5 = household size (number of persons eating from the same pot)

X_6 = farming experience (years)

X_7 = farm size (hectares)

$X_{8=}$ cassava output (kg)

e_i = error term

Table 1. Distribution of Socio-economic Characteristics of NDE Graduate Farmers in the Study Area

Variables	Indices	Standard Deviation
Gender (males)	57.78%	
Age (years)	43.40	10.93
Secondary Education	56.11%	
Farming Experience (years)	14	10.1
Farm Size (hectares)	1.5	0.04
Flock Size (number of birds)	90.5	79.44
Farm income (₦) Cassava Farming	325,500	232,114
Farm income (₦) Poultry Farming	421,400	319,320

Source: Field Survey, 2014

1USD = 175 NGN (Nigeria Naira) at the time of the research

Return on Investment (Performance) of Cassava and Poultry Farming in the Study Area

Return on Investment Analysis of Cassava Farming

Distribution of respondents according to the return on investment of cassava farming is shown in Table 2. The result reveals that the total revenue realized from cassava farming among beneficiary farmers was ₦252,000.00, with total variable cost of ₦166,200.00, Total Fixed Cost of ₦18,158.00, Gross margin of ₦

166,200.00 and a Net Income ₦148,041.50. The Return on Naira invested in cassava farming was ₦ 1.60 indicating that any N1 invested by a farmer in cassava farming in Imo State he gets ₦1.60. The result indicates that the NDE beneficiaries had a high Return on Investment of 142.40%.This result agreed with the result of the research work of [12], as they realized ROI of 90.51% from large scale cassava farmers, which was above 50%.

Return on Investment Analysis of Poultry farming

Table 2. Distribution of Respondents according to Return on Investment of Cassava and Poultry Farming

Items	Cassava Farming (₦)	Poultry Production(₦)
Revenue	252,000.00	703,800.00
Total variable cost	85,800.00	256,100.00
Total fixed cost	18,158.00	39,148.32
Gross Margin	166,200.00	447,700.00
Net farm income	148,041.50	408,551.68
Return on Naira Invested	1.60	1.52
ROI (%)	142.40	138.40

Source: Field Survey, 2014
1USD = 175 NGN (Nigeria Naira)
Performance Decision: 50% and above = High Performers, Less than 50% = Low Performers

Distribution of respondents according to the return on investment of Broiler production is shown in Table 2. The result reveals that the total revenue realized from poultry farming among beneficiary farmers was ₦703,800.00, with total variable cost of ₦256, 100.00, Total Fixed Cost of ₦39,148.32, Gross margin of ₦447,700.00 and a Net Income ₦408,551.68. The Return on Naira invested in poultry farming was ₦ 1.52 indicating that any ₦ 1 invested by a farmer in cassava farming in Imo State he gets ₦1.52. The result also indicates that the NDE beneficiaries had a high Return on Investment of 138.40% which is above 50% stated as the performance bench mark.
This result is in conformity with the findings of [14] where the return on investment on poultry production in Anambra State was 147%.

Factors Influencing Performance of NDE Graduate Farmers in Cassava Farming

The result in Table 3 shows the Ordinary Least Square multiple regression estimates of the determinants of NDE arable crop farmers in the study area. The Cobb-Douglas functional form was chosen as the lead equation because of a high R^2 value, number of significant factors and agreement with *a priori expectations*. The R^2 value of 0.8469 indicates 84.69% variability in farm income explained by the independent factors. The Z value of 12.07 was highly significant at 1% level of probability indicating that the regression was a good fit.
The coefficient for gender was positive and significant at 5% level of probability. This implies that the male crop farmers had performed in the enterprise than their female arable crop counterparts. The coefficient for marital status was negative and significant at 5% level. This implies that farmers who are single performed than their married counterparts. This is against *a priori expectation* probably because farmers who are married seem to be distracted with overwhelming domestic responsibilities. The coefficient for household size was also negative and significant at 5% level. This also is against *a priori expectation* probably because large household size which should have provided family labour may not be readily available. The negative sign showed that as performance decreases household size also increases. This is in line with the work of [7]. This may be because most time the children are in school. The coefficient for farm size was positive and significant at 10% level of probability. This is expected because increase in farm size will lead to more crop output thereby increasing performance of beneficiaries in the enterprise. The coefficient for crop output was positive and highly significant at 1% level of probability. This is expected and in agreement with *a priori expectation.* This implies that the increase in crop output will lead to a corresponding increase in performance of the beneficiaries in the enterprise.

Table 3. Regression Estimates of the Determinants of Performance of NDE Cassava Farmers in the Study Area

Variables	Linear	Exponential	Cobb-Douglas+	Semi-log
Constant	75688.81	11.5402	10.8921	-853090.6
	(0.38)	(29.78**)	(30.84***)	(-1.31*)
Gender	74382.18	0.2789	0.6681	79417.62
	(1.11)	(2.16**)	(2.63**)	(1.08*)
Age	688.65	0.0129	0.9771	228242.8
	(0.16)	(1.59*)	(1.45*)	(1.17*)
Marital Status	-77096.68	-0.2435	-0.2801	-72632.58
	(-2.50**)	(-4.11***)	(-2.24**)	(-2.17**)
Education	-13992.92	-0.02223	-0.2544	-9857.04
	(-0.34)	(-0.28**)	(-0.85)	(-0.11)
Household Size	-12123.57	-0.0330	-0.0880	-21825.61
	(-1.12*)	(-1.59*)	(-2.38**)	(-1.81*)
Farming Experience	7586.92 (2.03**)	0.00060 (0.84)	0.1346 (0.73)	41928.86 (0.78)
Farm Size	20361.55 (2.86**)	0.04197 (3.07***)	0.41126 (1.96*)	117503.30 (0.76)
Crop Output	0.4729	0.00001	0.6222	16695.79
	(1.61*)	(21.77***)	(8.22***)	(0.76)
R^2	0.3277	0.5807	0.8468	0.2133
R Adjusted Z	0.2613 4.94***	0.4689 74.77***	0.8016 12.07***	0.1347 2.71**

Source: STATA 8A Results, 2014
Variables in parentheses are Z-values + = lead equation
P≤ 10, ** P≤ 0.5 and *** P≤ 0.1

Factors Influencing Performance of NDE Graduate Farmers in Poultry Farming

The result in Table 4 shows the OLS multiple regression estimates of the determinants of NDE poultry farmers in the study area. The Linear functional form was chosen as the lead equation because of a high R^2 value, number of significant factors and agreement with a *priori expectation*. The R^2 value of 0.5228 indicates 52.28% variability in farm income explained by the independent factors. The Z value of 4.71 was highly significant at 1% level of probability indicating that the regression was a good fit. The coefficient for age was positive and significant at 1%. This implies that any increase in age is expected to lead to a corresponding increase in performance. This is against *a priori expectation* probably because the aged farmers seem to be more credible thereby making more sales than their younger counterparts. This result is in contrast with [21] as they found that age of farmers had profound effect in output and performance..

The coefficient for marital status was negative and significant at 10% level. This also implies that the poultry farmers who were single made more income than their married counterparts. This may be because they do not have overwhelming responsibilities affecting their production of livestock in the area. The coefficient for household size was negative and highly significant at 1% level. This is against *a priori expectation* probably because large household sizes bring about huge consumption needs thereby leading to a decrease in the level of performance among the poultry farmers. [1] in their study found that household size is an important input for unpaid labour. The coefficient for farming experience was positive and significant at 10% level of probability.

Table 4. Regression Estimates of the Determinants of Performance of NDE Poultry Farmers in the Study Area

Variables	Linear+	Exponential	Cobb-Douglas	Semi-log
Constant	409481.7	25200	10.2124	-424239.20
	(1.46*)	(12.16***)	(4.42***)	(-0.64)
Gender	-2503.59	0.0802	0.1028	-1957.24
	(-0.04)	(0.31)	(0.40)	(-0.03)
Age	12444.99	0.0235	0.7626	348923.50
	(2.93***)	(1.52*)	(1.27*)	(2.02**)
Marital Status	-67769.41 (-2.00**)	-0.0725 (-0.56)	-0.1265 (-1.03*)	-78757.80 (-2.22**)
Education	-80542.95	-0.2126	-0.6448	-222673.30
	(-1.47*)	(-1.06*)	(-1.66*)	(-1.88*)
Household Size	-355509.86 (-2.97***)	-0.1222 (-2.80**)	-0.4458 (-2.75**)	-117319.90 (-2.50**)
Farming Experience	6323.10 (1.88*)	0.0038 (0.32)	0.1323 (0.80)	30137.67 (0.63)
Flock Size	324.21	0.0025	0.2946	6886.34
	(2.98**)	(2.55**)	(2.36**)	(1.90*)
Poultry Output	341.97 (1.10*)	0.0008 (-0.78)	-0.1673 (-1.30)	-44814.17 (-1.20*)
R^2	0.5228	0.3412	0.3001	0.40441
R Adjusted Z	0.4142 4.71***	0.2644 3.14***	0.2211 2.53**	0.3255 2.60**

Source: STATA 8A Results, 2014
Variables in parentheses are Z-values + = lead equation
P≤ 10, ** P≤ 0.5 and *** P≤ 0.1

This implies that experienced farmers performed than their counterparts who had no or little poultry experience. This result is in agreement [4]that the more farmers remained in the farming business, the more they got acquainted with the risk elements and ways of militating possible losses through them. The coefficients for flock size and poultry output were positive and highly significant at 1% land 10% levels of probability respectively.

This implies that any increase in flock size and poultry output will lead to a corresponding increase in poultry performance. This is

expected and in accordance with *a priori expectation.*

CONCLUSIONS

The result from this study has revealed that the scheme impacted positively on the graduate farmers farming activities. The result indicates that the NDE graduate farmers had a high Return on Investment of 142.40%. and 138.40% from cassava and poultry farming respectively. Factors such as gender, marital status household size, farm size crop output influenced performance of the cassava farmers in the scheme. Also, age, marital status, household size farming experience, flock size and poultry output influenced performance of the poultry farmer's performance in the scheme.

The study therefore recommends; proper funding of the scheme in order sustain its training mandates, awareness and sensitization of the programme agricultural activities to encourage youths participate in the scheme and follow – up and monitoring of graduated farmers to ensure that they judiciously utilize incentives provided by the scheme.

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EFFECT OF AGRICULTURAL EXTENSION DELIVERY METHODS ON ARABLE CROP FARMERS' CROPPING SYSTEMS IN KADUNA STATE, NIGERIA

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Abstract

This study analysed effect of agricultural extension delivery methods on arable crop farmers' cropping systems in Kaduna State, Nigeria. Purposive and multi-stage random sampling procedure was used to select 120 arable crop farmers across the state. Data were collected with a structured questionnaire and analysed using descriptive and correlation coefficient analysis. The result indicated that 57.50% of farmers were males, with mean ages of 56.20 years, mean farming experience of 39.3 years and mean farm size `of 1.86 hectares. Extension delivery methods used by the agencies were demonstrations (88.4%), adopted village (81.5%), on – farm adaptive research (75%) and group (70%). The effective extension delivery agencies in the study were; National Agricultural Extension and Research Liaison Services ($\bar{X}$ =2.8), World Bank project ($\bar{X}$ =2.6) and Faith Based Organisations ($\bar{X}$ =2.5). The most common cropping systems practiced by farmers in the study area were sole maize (97%), sole millet (87.50%), sole cowpea (85.40%) and sole groundnut (72.40 %). Result also shows that farmers had favourable attitude ($\bar{X}$ =2.2) towards agricultural extension delivery methods used by the agencies, with an attitudinal index of 73.33%. The correlation coefficient analysis showed a significant relationship (P<0.01) between agricultural extension delivery methods and cropping systems of farmers in the study area. The study recommends training and retraining of extension workers, provision of mobility and adequate funding of extension agencies for effective agricultural technology delivery in the study area.

Key words**:** *analysis, extension, methods, farmers, cropping systems*

INTRODUCTION

The success of extension service delivery depends on the expertise and technical know-how of the extension personnel, which could be achieved by providing adequate and relevant information. The extension services therefore are used to serve as a vehicle for conveying and educating farmers on the new agricultural policies and practices. Perhaps, for this to be optimally realised, well trained and articulated extension workers are needed to extending extension messages to wide range of farmers who live significantly in the rural areas [18]. [1] added that for these farmers to improve their farming practices towards adopting new technologies or improved farming practices; certainly they require to be trained in order to use different extension methods. [10] noted that agricultural technology has remained a viable tool for improving the productivity of the agricultural sector in Nigeria. [7] emphasized the need for agricultural extension services which plays significant role in promoting the adoption of new technologies and innovations through communication with farmers and educating them so as to improve their attitude, knowledge and skills need to be funded.

Extension methods are effective means of communication meant to transmit knowledge and skills and, that target farmers may easily see, hear, and learn the things conveyed by extension worker [8]. There are various extension teaching methods used as tools by the extension worker to effect desirable changes in the behaviour of farmers, arrange the best learning situations and provide opportunities in which useful communication and interaction takes place between extension workers and farmers. Such teaching methods/pathways include group training, demonstration plot, adopted villages, On - Farm Adaptive Research and mass media [11].

Extension methods like demonstration plots, seed multiplication programme and field days and among others are some of the major weapons for introducing the findings of modern research in agricultural practices to increase agricultural production in particular and improve welfare of target farmers [2]. There is a growing recognition that farmers and rural community members have demands for information and appropriate farming methods that are not being achieved. Farmers need to be aware about increase in their productivity and income through several channels such as extension agents, individual farmer to farmers contact, print media (Newspaper, magazines, newsletters, leaflets, posters, electronic media and among others) have to be widely used in disseminating information to farmers [4]. Intercropping is the practice of growing more than two crops on the same piece of land such that the period of overlapping is long enough to include the vegetative stage. In Nigeria, as in many other countries, mixed cropping often involves the intercropping of a cereal with legume. The cereals being the main crop while, legumes are regarded as a cash crop [14]. In particular intercropping cereal with legume may produce yield advantage over the component sole crops [5]. [9] further suggested that there is need for strategic investment, research and development together with local, national and international cooperation to improve agriculture development.

Unfortunately, when planning research projects, policy makers give little or no consideration to information dissemination as a crucial aspect of research project implementation forgetting the fact that , there is the need to accelerate the pace of dissemination of the research findings to farmers. The most inherent problem confronting extension delivery in Nigeria is illiteracy levels of farmers, poorly motivated in terms of remuneration and provision of transport facilities to visit the farmers, inadequate funding of extension delivery institutions and low ratio of extension agents to farmers' [3]. This scenario has drastically affected the application and dissemination of various extension methods in the country [17].

Since some of these extension delivery methods are known to be effective it is not certain whether they have impacted positively on the cropping systems of arable crop farmers in the state. Hence, this study was designed to analyse the effect of agricultural extension delivery methods on arable crop farmers' cropping systems in Kaduna state, Nigeria.

Specific objectives were to:

(i)describe the socio – economic characteristics of farmers in the study area

(ii)identify different extension delivery methods used by the agencies

(iii)assess effectiveness of agencies in extension delivery in the study area

(iv)identify different types of cropping systems prevalent in the study area and;

(v)ascertain farmers' attitude towards the extension delivery methods in the study area

Hypothesis:

H_{O1}: There is no significant relationship between extension delivery methods and farmers' cropping systems in the study area.

MATERIALS AND METHODS

The study was conducted in Kaduna state Nigeria. The state lies between Latitude $9^0\ 03^1$ and $11^0\ 32^1$ North of the Equator and Longitudes $6^0\ 05^1$ and $8^0\ 38^1$ North of the Greenwich Meridian. The state shares common boundaries with Abuja in the South –East and six other states namely; Katsina, Kano, Zamfara in the North, Nasarawa and Plateau in the North – East and Niger in the North – West respectively. Kaduna state has rainfall ranging between 942 mm and 1,000 mm per annum, Relative humidity of 56.64% and mean annual temperature of between 35^0C - 37^0C. The state is made up of twenty three Local Government Areas (LGAs) which is subsumed into four Agricultural zones namely; Samaru, Lere, Birnin – Gwari and Maigana zones. Most of the people in the state, especially rural dwellers are engaged mainly in subsistence farming. The major crops grown include; maize, groundnut, rice, soybean, millet, water melon and okra.

Purposive and multi-stage random sampling procedures were used in the study. Purposively

two agricultural zones namely; Samaru and Lere were selected because of intensity in arable crop production prevalent in the area. A multistage random sampling technique was adopted in the selection of blocks, circles and arable crop farmers. First five blocks each were randomly selected from each of the two zones to give a total of ten (10) blocks. From the selected blocks, three (3) circles each were randomly selected to give a total of thirty (30) circles. Finally five (4) arable crop farmers were randomly selected from the selected circles that gave a total of one hundred and twenty (120) farmers.

Data from the study were analysed using frequency distribution, percentages, graphs and mean scores. Effectiveness of agricultural extension delivery methods was realised by using a 3-point Likert type scale namely; very effective =3, effective = 2 and not effective = 1. The bench mark was obtained thus; 3+2+1 = 6 divided by 3 to give 2.0. Any mean score of 2.0 and above is effective, otherwise non effective. The attitude of farmers towards agricultural extension delivery methods used by extension agencies was captured by getting responses on 10 attitudinal statements using a 4 - point type Likert scale namely; Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1). The bench mark was obtained thus; 4+3+2+1 = 10 divided by 4 to give 2.5. Based on the obtained mean score decision rule, any mean score of 2.5 and above implied favourable attitude and otherwise unfavourable. The Attitudinal Index was obtained by dividing the grand mean attitudinal score by 4 (i.e. the 4 – point Likert type scale).

RESULTS AND DISCUSSIONS

The socio-economic characteristics of respondents are shown in Table 1. The result revealed that a high proportion (67.5%) of the respondents were males, while 42.5% were females, as against 35.00% that acquired primary education. This implies that males dominated farming activities in the study area. This result is in contrast with [15] that women are found to dominate farming activities thereby producing the bulk of food in Nigeria, but can make decisions on farming activities based on years of farming. The result also indicates that 62.00% of the respondents were married with mean ages of 56.2 years. The age of the farmers suggests that they were not in their productive ages, thereby having adverse implication on agricultural production. The result is in tandem with [13], who obtained a similar result among arable crop farmers in Abia state, Nigeria. The mean household size for the farmers was 6.3 persons, farming experience of 39.8 years while they cultivated on mean farm size of 1.86 hectares. Household size in turn provides cheap labour for agriculture and other remunerative activities.

Table 1. Selected socio-economic characteristics of respondents in the study area (n = 120)

Variables	Frequency	Percentage	Mean
Gender			
Male	69	57.5	
Female	51	42.5	
Age (years)			
20 – 30	6	5.00	
31 – 40	15	12.50	
41 – 50	42	35.00	**56.2 years**
51 – 60	47	39.17	
61 – 70	10	8.33	
Marital Status			
Single	11	9.17	
Married	78	65.00	
Divorced	2	1.67	
Widowed	13	10.83	
Separated	2	1.67	
Household Size			
1 – 3	7	5.83	
4 – 6	33	27.50	**6.3 persons**
7 – 9	65	54.17	
10 – 12	15	12.50	
Education (years)			
No Formal Education	28	23.33	
Primary Education	42	35.00	
Secondary Education	38	31.67	
Tertiary Education	12	10.00	
Farming Experience (years)			
1 – 10	8	6.67	
11– 20	9	7.50	
21-30	92	76.67	**39.8 years**
31- 40	11	9.16	
Farm Size (ha)			
0.1 - 0.5	12	10.00	
0.6 - 1.0	38	31.67	1.86 hectares
1.1 – 1.5	58	48.33	
1.6 – 2.0	12	10.00	

Source: Field Survey 2017

Extension Methods

Data on Fig. 2 reveal that Demonstrations (88.4%), Adopted Village Approach (81.5%), On -Farm Adaptive Research (75%) and Group Methods (70%) were the most effective

methods of technology transfer adopted by extension delivery agencies in disseminating improved agricultural production technologies to farmers in the state. Demonstrations such as Small Plot Adaptive Techniques (SPATs) and Management Training Plots (MTPs) are identified as the common techniques used by extension agencies in extension delivery in the country [12]. This result suggests that since individual methods have many setbacks, extension outfits in the country adopted other methods identified to be group-oriented in order to extend agricultural information to target farmers. [16] is of the view that there is a gap between yields which farmers can obtain through the current use of these extension strategies on improved technologies 6.5 times when compared to traditional sources. This gap could be covered through technology transfer which is the sole responsibility of extension institutions in Nigeria [6].

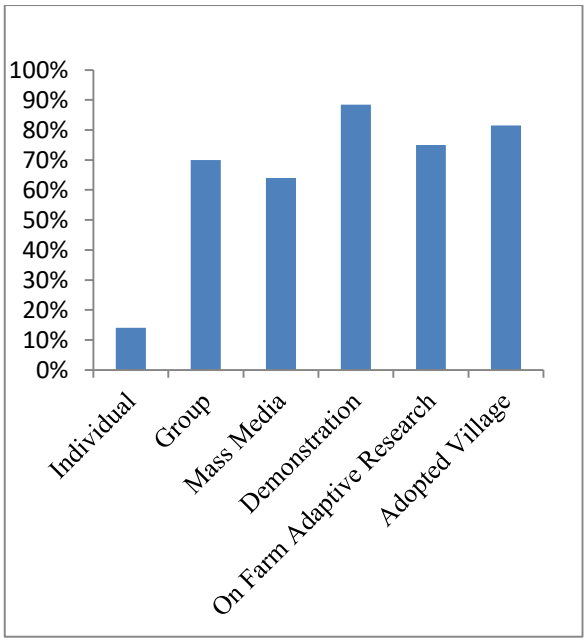

Fig. 1. Showing Extension Delivery Methods

Effectiveness of Agricultural Extension Agencies

Data on Table 2 shows that National Agricultural Extension and Research Liaison Services (NAERLS) ($\bar{X} = 2.8$), World Bank Projects (FADAMA and IFAD) ($\bar{X} = 2.6$) and Faith Based Organisations (FBOs) ($\bar{X} = 2.5$) were institutions that were very effective in extension delivery in the state.

The effectiveness mean scores for these agencies was 2.3 indicating that they were effective.

This result is in consistent with [12] and [3] that donor sponsored agricultural agencies and institutes play significant and complementary roles in extension delivery in Nigeria.

Table 2. Effectiveness of Agencies in Extension Delivery in the Study Area

Extension Agencies	Effectiveness
National Agricultural Extension and Research Liaison Services (NAERLS)	2.8*
Agricultural Development Programmes (ADPs)	2.4
Faith Based Organisations (FBOs)	2.5*
World Bank Projects (FADAMA and IFAD)	2.6*
Institutions (Colleges of Agriculture and University Faculties of Agriculture)	1.3
Mean Score	**2.3**

Source: Field Survey Data, 2017 *Effective

Types of Cropping Systems

Result in fig 3 indicate that majority (97%) of the farmers plant sole maize, sole millet (87.50%), sole cowpea (85.40%) and sole groundnut (72.40%) as types of framing system practiced in the study area. Furthermore, they intercropped maize/groundnut (71.40%), maize/cowpea (70.30%) and maize/soya bean (63.80%).

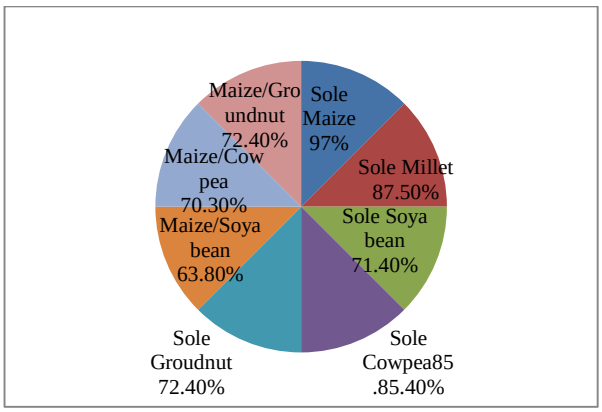

Fig.2..Showing Types of Cropping Systems

This result is in contrast with [19] that intercropping is the growing of two or more crops simultaneously on the same piece of land aimed at maximizing the use of natural

resources, which is a popular cropping system among small scale farmers in the tropics.

Table 3. Attitude of Farmers towards different Extension Methods used by Agencies in Extension Delivery in the Study Area

Attitudinal Statements	Mean Scores
Extension methods taught did not improve crop yield	1.8
Extension workers have sufficient information on the different extension delivery methods	2.3*
Materials used in technology transfer were adequate	2.1*
Extension workers were friendly to target audience	2.2*
The training sessions were very conducive	2.0*
Time allotted for any training session were enough to handle any subject matter taught	2.1*
Methods used are problem solving oriented	2.5*
The training session was interactive and participatory	2.4*
The extension agency follow – up farmers' farming activities	2.1*
Farmers have confidence in the Subject Matter Specialists	2.4*
Grand Mean	**2.2**
Attitudinal Index	**0.7333%**

Source: Field Survey Data, 2017
*Favourable Attitude

Attitude of Farmers

Table 3 reveals that among the attitudinal statements of the respondents disagreed on non - improvement of extension methods on farmers' yield ($\overline{X} = 1.8$) as against others. The total mean score was ($\overline{X} = 2.2$) indicating that the farmers had favourable attitude towards different extension methods employed by extension agencies in technology dissemination. Also, the farmers had 73.33% attitudinal index responses of these extension delivery methods.

Correlation Coefficient Analysis

Data in Table 4 shows the relationship between extension methods and farmers' cropping systems. The result reveals a correlation coefficient (r^2) of 0.9213, which was significant at 1% level of probability. This indicates a positive relationship. The implication of the result is that any increase in extension methods will lead to an increase in farmers' cropping systems in the study area.

Table 4. Relationship between Extension Delivery Methods and Farmers' Cropping Systems

Variables	Correlation Coefficient (r^2)
Extension Methods	0.9213***
Cropping Systems	0.0045

Source: Field Survey Data, 2017
*significant at P<0.01 of probability

CONCLUSIONS

The study has revealed that extension delivery agencies in the study area effectively used extension methods in disseminating agricultural technologies to farmers. Farmers also had favourable attitude of these extension methods in improving their cropping systems. There was a significant relationship between the different extension delivery methods and farmers cropping systems in the study area.

The study therefore recommends training and retraining of extension workers in order to be abreast with the latest techniques and approach to extension delivery. There is also need to provide mobility (motorcycles) to extension workers to ensure wide coverage of service areas. Adequate funding of extension agencies is very crucial for effective agricultural technology delivery in the study area.

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SECTORAL CONTRIBUTION TO GROSS DOMESTIC PRODUCT (GDP) IN NIGERIA ECONOMY (1970 – 2012)

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Abstract

This work aimed at determining the effect of sectoral contributions to the GDP of Nigeria from 1970-2012. The specific objectives were to examine the trend of the sectors selected, and their effect to the Nigeria's economy over the study period, the historical secondary data was obtained from Central Bank of Nigeria (CBN), Nigerian Bureau of statistics (NBS), and federal Ministry of Agriculture and Rural Development (FMARD). The objectives were analysed using trend analysis graph, Pearson correlation and multiple regression analysis. It was observed that the various sectors (agricultural, petroleum, education, health and telecommunication sectors) over the study period has contributed to the growth of GDP of the Nigeria economy at various rates, it is believed that the sectors will contribute more in years to come to the GDP, leading to a speedy growth of the economy if effective and sustainable policy be put in place by the Government.

Key words**:** *GDP, economy, sectors, growth, Nigeria*

INTRODUCTION

Agriculture in Nigeria is a major branch of economy in Nigeria, providing employment for 70% of the population. The sector is being transformed by commercialization at the small, medium and large-scale enterprise levels. Major crops include beans, sesame, cashew nuts, and cassava, cocoa, beans groundnut, gum Arabic, cola nut, maize (corn), melon, millet, palm kernels, palm oil, plantain, rice, rubber, sorghum, soya beans and Yams [10].
In 1990, 82 million hectares out of Nigeria's total land area of about 91 million hectares were found to be arable, although only 42 percent of the cultivable area was farmed. Much of this land was farmed under the bush fallow system, whereby land is left idle for a period of time to allow natural regeneration of soil fertility. 18 million hectares were classified as permanent pasture, but had the potential to support crops. Most of the 20 million hectares covered by forest and woodlands are believed to have agricultural potential [15].
Fishery, livestock production, and crop production constitutes the Nigeria's Agricultural sector, and it's holdings are small and scattered, and farming is carried out with simple tools. Large-scale agriculture is not common. Agriculture contributed 32% to Gross Domestic Product (GDP) in 2001 [5].
Until the 1970's, agriculture accounted for over 60 percent of Nigeria's gross domestic product Gross Domestic Product (GDP) and agricultural commodities were the country's main exports. Decades of misplaced policies, under investment and technological stagnation, however, have turned Nigeria into a net importer of food. Recently, an average of ₦24 trillion ($ 150 billion) is spent importing food each year, and government policies such as former President Olusegun Obasanjo's Operation feed the nation during the military regime (1979), former president Alh. Shehu Shagari's (1979) "green revolution programme" and Yar Adua's (2007) "7-point agenda"- faced to turn around the agricultural sector's fortunes. With the question if the president Goodluck Jonathan's 'Agricultural transformation' initiated through 2012 will fare any better [1]. In Nigeria, the oil sector has assumed a central role in the economy in such a way that it cannot be overemphasized. Between 1981 and 1999, Nigeria received over 228 billion US dollars from petroleum export.

The inflow of foreign exchange from petroleum export has overwhelming influence on the economy. The growth in GDP since the early 70's is largely attributed to crude oil production.

Moreover, over development plans were focused on the expected earnings from crude oil export as a source of finance. More specifically, the Nigerian revenue budget since oil took a primal position in revenue attraction is directly a function of the price per barrel of crude oil and the projected total sales.

Nigeria was a predominantly agrarian economy before the discovery of oil in commercial quantity and remained so up to the early part of the 1970's. Thereafter oil exerted tremendous impact on the economy. In Nigeria's attempt to make oil exploration a lucrative business, there was a shift in its dependence from the agricultural sector to the oil sector, largely based on the innumerable benefits it derived from the later (oil Sector). This attitude has brought about a major decline in the agricultural sector and even other sectors of the economy, thereby making the Nigerian economy a mono-economy [4].

It is believed that the problem of food crises has its root in the gradual transformation of the Nigerian economy accelerated with the impact of the oil price increases during the 1970's, Nigeria who could provide her own food, regardless of its population now has to import staple commodities such as rice, sugar etc.

The agricultural sector has gradually ceased to be what it used to be because of the new rave for oil. States like Delta state, Rivers, Bayelsa, etc, are worst as they all have tales of woe to tell, as the catastrophic effects of oil spillage has led to inestimable losses that has led to gradual decline of agriculture in some areas of the region.

Many financial experts are of the view that an economy that largely depends on a sector is definitely not a healthy one. A healthy economy is one that is diversified and not mainstreamed. It appears as if Nigeria has put all her eggs in one basket, standing at the risk of losing if something should go wrong [4], [14].

A cursory glance on the quality of education in Nigeria today reveals that Nigeria has a long way from reaching neither the promised land of education for all by 2015 nor its dream of being one of the 20 best world economies by 2020. The Nigerian education system which produced world renowned scholars in the past has become a shadow of itself today. The rot in the nation's education system has reached such a deplorable proportion that if not summarily addressed now; subsequent generations of Nigerians will continue to suffer its consequences [2].

In line to consider for this study is the health sector in Nigeria.

Health care provision in Nigeria is a concurrent responsibility of the three tiers of government in the country. Private providers of health care have a visible role to play in health care delivery. The federal government's role is mostly limited to coordinating the affairs of the university teaching hospitals, federal medical centers (Tertiary health care) while the state government manages the various general hospitals (Secondary health care) and the local government focus on dispensaries (Primary health care), which are regulated by the federal government.

The total expenditure on the health care as % of GDP is 4.6, while the percentage of federal government expenditures on health care is about 1.5%. A long run indicator of the ability of the country to provide food sustenance and avoid malnutrition is the rate of growth of per capita food production, from 1970-1990, the rate for Nigeria was 0.25%. Though small, the positive rate of per capita may be due to Nigerians importation of food products [7].

From all indications, the health condition in Nigeria is highly deplorable. Among the most common diseases in Nigeria are malaria, guinea worm, pneumonia, measles, gonorrhea, schistosomiasis, typhoid, tuberculosis, chicken pox, diarrhea and more recently, Aids. Whereas reported cases from noticeable diseases were about 1.78 million in 1991, the figure rose to sum 2.06 million by 1995. Reported deaths from diarrhea N rose from 1,404 in 1991 to 1,416 in 1995 while those from diarrhea B rose from 573 to 640 over the

same period. Malaria, on the other hand, claimed about 1,947 lives in 1991, rising to 3,268 by 1995 and measles claimed 388 in 1991 rising to 671 in 1995. Also, during the same period, deaths due to pneumonia almost doubled, rising from 855 to 1,594, while deaths due to Typhoid fever increased from 259 to 707.

The last sector to be considered in this study is the telecommunication sector; In terms of growth, Nigeria is ranked the largest and fastest growing ICT market in Africa and among the ten fastest telecoms growth markets in the world. This is as a result of the robustness of its returns on investments. The impact of this on the economic growth has become impressive. The telecommunication sector now contributes significantly to the Gross Domestic Product (GDP), which was hitherto dominated by the Oil sector. Also the Nigeria telecommunication face sheet released by the United State embassy in Nigeria in October 2011, noted that "The ICT Sector is the fastest and most robust sector of the Nigeria economy. Contributing more than the manufacturing, banking and solid minerals sectors combined". The fact sheet also revealed a service sector contribution to GDP 2010 chart, showing that ICT contributed 25%, while utilities 17%, finance and insurance 20% Transport 15%, Real Estate and business services, 10%, Hostels and restaurants 3% and other 10%.

Meanwhile, if statistics on the fact sheet are anything to go by ICT investment spiked 700% in 2001 and received double-digit growth every subsequent year. A factor that saw investment rising by 13% to 518 billion in 2009 [9].

The agricultural sector, once the bedrock of the Nigerian economy has witnessed a society decline since the discovery and commercialization of Nigeria's abundant crude oil products. While on the other hand, the oil sector has witnessed some problems ranging from bunkering of petroleum products, pipe line vandalization, non-functional refineries and lack of proper accountability on income generated from the sector [3].

Health, telecommunication and education sector in Nigeria are faced with similar problems which include mismanagement and embezzlement of fund allocated to the sectors leading to the employment of poor infrastructural facilities, and poor internal management of the sector [8].

Objectives of the Study:

-to examine the trends of the selected sectors during the study period;

- to analyze the effect of the various sectors to the Nigeria's Gross Domestic Product of the economy over the study period;

- to analyze the relationship between the sectors and economic growth.

MATERIALS AND METHODS

Nigeria is situated in the West Africa between the latitude of 40-140^0 and longitude of 30-140^0 East of green which meridian, this is entirely within the tropical zone. It is bounded on the South by the Atlantic Ocean, in the North by Niger Republic, the West by Benin republic and in the North East by Cameroun. The country is the most populated in the African continent and has an estimated population of 40,003,542 people mixed of over 250 tribes and has a total land area of 923,768, and 00 Square kilometers [11].

Nigeria is made up of 36 states and a federal territory capital comprising of 6 geopolitical zones- the north- central, North-East State, South East, South-Southern State and South West with 774 local government areas and its official language is English [13].

The country is blessed with abundant human and natural resources like coal, Columbites, gold, iron, lignite ethanol, phosphate, tin, ore and gas, cocoa, cement, steel iron ore, rubber, rice, salt, limestone, marble, plywood etc, fertile land and a variety of climatic conditions from tropical in the high lands [6].

Nigeria is in a good position to develop her abundant human and natural resources for increased agricultural productivity and also to be the basic and the head in the exportation of agricultural products worldwide [12].

Sampling Procedure

The study relied mostly on the use of aggregate secondary data. The study made use of secondary data mainly from various issues of central Bank of Nigeria (CBN) annual reports

and statement of account, Federal Ministry of Agriculture and Rural Development (FMARD) and National Bureau of Statistics (NBS).

Method of Data Analysis

Data collected were analyzed using trend analysis graph, multiple regression analysis and Pearson correlation. The objective one was analyzed using trend analysis graph, while objective two was analyzed using Pearson correlation and multiple regression analysis.

Model Specification

Regression Model is as specified below

$Y = f(X_1, X_2, X_3, X_4, X_5, \ldots\ldots X_n, e)$

where

Y = GDP(Gross Domestic Product)

X_1 = petroleum sector revenue (₦)

X_2 = agricultural sector revenue (₦)

X_3 = education sector revenue (₦)

X_4 = health sector revenue (₦)

X_5 = telecommunication sector revenue (₦)

e = error term

RESULTS AND DISCUSSIONS

The trends of the selected sectors: The trends examined the petroleum sector, agriculture sector, education sector, health sector, telecommunication sector and the Gross Domestic Product (GDP) of the Nigeria economy.

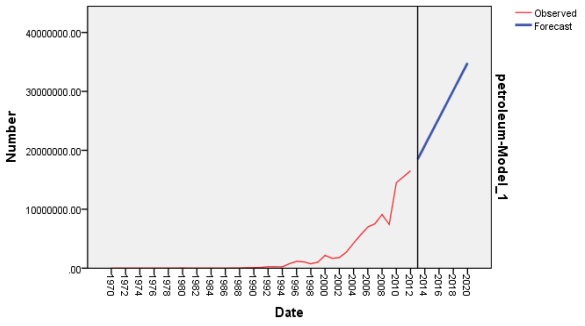

Fig.1.Trend Analysis graph of the Contribution of Petroleum. Numbers are in naira (₦)
Source: CBN statistical bulletin 2014.

The graph above (Fig.1.) shows that from 1990 to 1994 the income generated from the petroleum sector was negligible, it experienced a drastic increase reaching ₦10,000,000 with a steep decline in 2009, rising again in 2010 steeply but still below ₦20,000,000 and from 2011 to 2012 it experienced an increase at a decreasing rate. Petroleum income generation is expected to increase drastically from 2013 to 2020 above ₦30, 000,000 in favor of GDP.

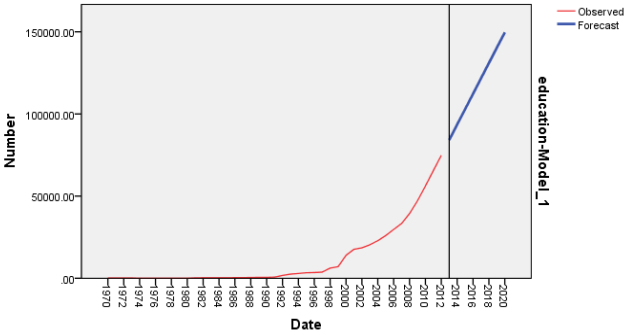

Fig.2.Trend Analysis graph of the Contribution of Education
Numbers are in naira (₦)
Source: CBN statistical bulletin 2014.

Following the graph above, it was observed that from 1990 to 1999, income generation from the education sector was at a sluggish increase, it rose from 2000 to 2012 above the point of ₦50,000 but still below ₦100,000 it is expected that from 2013 to 2020, income from the education sector will experience a drastic increase up to the point of ₦150,000, leading to a rapid growth in GDP.

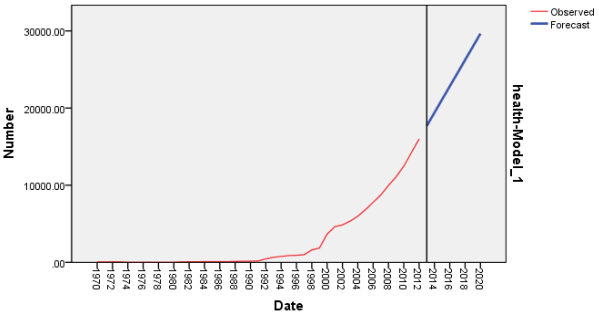

Fig.3.Trend Analysis graph of the Contribution of Health. Numbers are in naira (₦)
Source: CBN statistical bulletin 2014.

Income generation from the health sector experienced a sluggish rise from 1990 to 1999, from 2000 it experienced a significant increase till 2012 crossing the point of ₦10,000, it is expected to rise steeply from 2013 to 2020 to the point of ₦30,000 in favor of GDP.

Telecommunication sector has its income to the GPD rising from 2000 to 2004 at a gradual rate, it experienced a steep increase from 2005

to 2006 above ₦200,000. It witnessed an increase at a decreasing rate from 2007 till 2010 when it experienced another drastic increase above ₦300,000 in 2012.

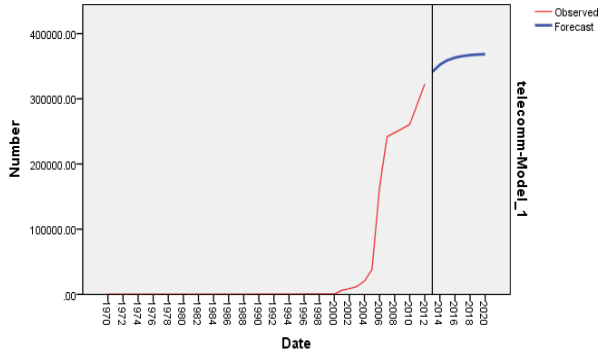

Fig.4.Trend Analysis graph of the Contribution of Telecommunication. Numbers are in naira (₦)
Source: CBN statistical bulletin 2014.

It is expected to increase at a decreasing rate from 2013 to 2020 due to an improved investment environment in the Nigeria telecommunication sector resulting from favourable government policy towards the sector.

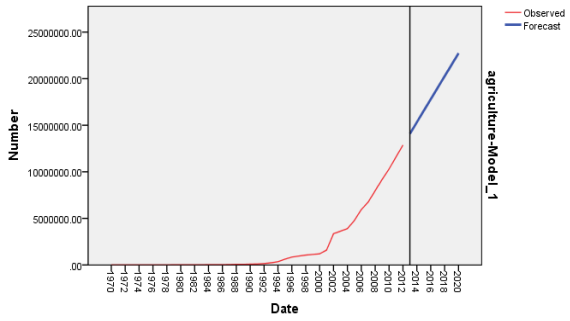

Fig.5.Trend Analysis graph of the Contribution of Agriculture. Numbers are in naira (₦)
Source: CBN statistical bulletin 2014.

Revenue from the agricultural sector (Fig.5.) experienced a gradual increase from 1991 to 2000, rose steeply in 2001 to 2002, where it maintained another gradual increase at a decreasing rate till 2004 reaching the point of ₦5,000,000 then witnessed another drastic rise from 2004 to 2012 hitting the point of ₦15,000,000. Revenue generation from agriculture is expected to rise steeply from the point of ₦15,000,000 in 2013 to 2020 above ₦20,000,000.

The GDP of Nigeria began a gradual increase from 1998 to 2010, hitting a point slightly below ₦10,000,000 in 2012. The GDP of Nigeria economy is expected also to have a steep increase from 2013 to 2020 rising above ₦40,000,000 according to the graph, leading to an improvement in the Nigeria Economy, due to an increase in the contribution of the various sectors to the GDP as a result of improved policy and even distribution of government's attention to the various sectors of the economy (Fig. 6).

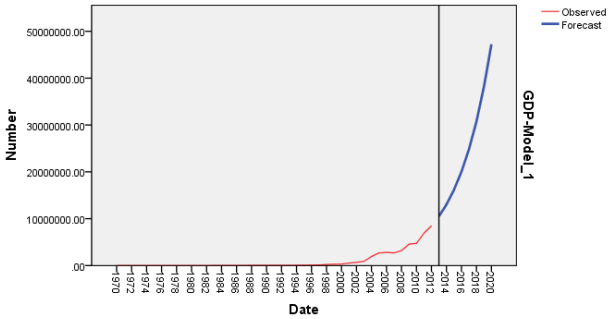

Fig.6.Trend Analysis graph of GDP. Numbers are in naira (₦)
Source: CBN statistical bulletin 2014.

The effect of the various sectors to the Nigeria economic growth

Multiple Regression Analysis was used to analyze the effect of the various sectors to the Nigeria economy.

Double log functional form was chosen as the lead equation based on the R^2, coefficient of multiple determinations, F- ratio, number of significant variables, and the conformity of the signs of regression coefficient with apriori expectation.

The value of R^2 which was 0.984 means that 98.4% was variation observed in the dependent variables included in the model.

Petroleum, education and telecom had a positive and significant relationship with GDP while health and agriculture had a negative and significant relationship with GDP.

Revenue generated from petroleum was significant at 1% and positively related to GDP. This means that as income on petroleum increased, the value of GDP also increased. Increased income on petroleum could be due to the increasing price on petroleum. The more

the price on petroleum, the more the income and the more the contribution to GDP.

Revenue generation from health was significant at 1% and negatively related to GDP. This means that as income generated from health increased, the value of GDP decreased and vice-versa., this is because poor health condition of a large number of the population reduces the value of GDP, and also going by the fact that the total expenditure on the health care as % of GDP is 4.6, while the percentage of federal government expenditures on health care is about 1.5%.as postulated by [3].

Table 1. Summary table of the Multiple Regression Analysis

Variables	Linear	Exponential	Semi-log	Double-log +
Constant	-39613.445	9.415	1.381	-.9510141.709
	(-0.664)	(45.265)***	(1.159)	(-3.159)
Petroleum	0.017	4.659E-008	-0.040	5115069.98
	(0.249)	(0.194)	(0.251)	(12.86)***
Education	203.026	0.000	1.137	11125193
	(5.482)***	(-2.693)***	(1.175)	(4.551)***
Health	-722.610	0.002	-1.299	-10280952.79
	(-5.228)***	(4.310)***	(1.416)	(-4.435)***
Telecom	0.697	-1.450E-00	0.327	677413.479
	(0.336)	(-2.120)**	(6.432)***	(5.270)***
Agriculture	0.294	2.579E-007	0.651	-1658190.113
	(1.757)**	(0.442)	(2.753)**	(-2.773)***
R^2	0.978	0.852	0.858	0.984
R^{-2}	0.975	0.833	0.834	0.981
F-ratio	334.854***	42.762***	36.284***	365.674***

Source: CBN statistical bulletin and field survey 2014.
( ) : figures in parenthesis are t-values.
*** : Significant at 1%, ** : Significant 5%, * : Significant 10%

In education, the income generated was positively related to GDP, and significant at 1%, this means that as income on education increased, the value of GDP also increased. This because the higher the number of the population undergoing education at various level, the higher the income generated from the education sector and the more skilled the labour force of the country, leading to an increased value of GDP.

Income generated from telecommunication was significant at 1% and positively related to GDP. This implies that as income on telecommunication increased, the value of GDP increased. The increase in the income from telecom sector could be as a result of its patronage by individuals and firms in order to reach out for suppliers and customers around the world in order to improve sales and services which in turn gives rise to a higher value of the country's GDP

Agricultural income was significant at 1% and negatively related to GDP, meaning that as income from agriculture increases, the value of GDP decreases and vice-versa. This means that contribution of agriculture to GDP growth has declined from 70% in 1970's to about 30% in 2001 according to [2]. And this is attributed to the Nigeria's attempt to make oil exploration a lucrative business, thus shifting its dependence from agricultural sector to oil (petroleum) sector based on the innumerable benefits it derived from it (oil sector). Thus making Nigerian economy a mono-economy [4].

The relationship between the sectors and economic growth of Nigeria

Pearson Correlation showing relationship between the selected sectors and economic growth of Nigeria(GDP).

Table 2. Summary table of the Pearson's Correlation Coefficient

	Pet	Edu	Health	Tele	Agric	GDP
Pet	1					
Edu	0.982**	1				
Health	0.971**	0.996**	1			
Tele	0.945**	0.934**	0.928**	1		
Agric	0.981**	0.993**	0.992**	0.958**	1	
GDP	0.975**	0.977**	0.959**	0.936**	0.974**	1

Source: CBN statistical bulletin 2014.
*** = significant at 5%*

The table above shows that there is a positive relationship between petroleum and education, however the relationship is significant at 5%. This is because, the higher the number of educated population, the more experienced and productive the staff working under the petroleum sector becomes, leading to an increase in output and its income to the GDP

Education and petroleum has a positive relationship with the health sector which is also significant at 5%, this is due to the fund from the petroleum sector which used to revitalize the health sector and on the other hand, the greater the number of educated population, the higher the number of professional personnel in the health sector which include the nurses and doctors and also the more the educated the population becomes, the more they become aware on how to manage their health and prevent illness which lead to a healthy work force. Together contributing to increase productivity and rise in GDP.

Health as well as education and petroleum have a positive relationship with the telecommunication sector at a 5% level of significant respectively. Health of staffs are essential and also one of the factors affecting productivity in the telecom sector, a telecommunication sector which takes the health and safety of its workers as a priority will experience a higher yield which increased GDP.

Also the telecommunication sector operates in the absence of technologically competent personnel which is obtained through education. The higher the educated and experienced personnel in the telecom sector in terms of management and technology, the higher their income and contribution to GDP.

On the other hand, petroleum is needed in the telecom sector as one of the most essential input to run its day-to-day activities, a hike in the price of petroleum leads to a decrease in the income generated by the telecom sector and vice-versa, affecting GDP adversely or favorably as the case may be.

The telecommunication sector, health, education and petroleum all had a positive relationship with agriculture and significant at 5% respectively. This is due to the importance of communication between farmers, suppliers and buyers from far and wide which increase farm income, yield and affect GDP positively. Also health of farmers is important for high productivity in the farm which improves GDP. Education is another variable, very essential to all farmers both in fishery, crop and livestock productions which improves performance as a result of good management of the farm, mechanization and improved varieties of seedlings and breeds, these together enhance, productivity and yield thereby making the GDP attractive.

Petroleum availability for farm product preservation and operation of tractors etc. improves farm yield and in the long run favors GDP.

From the above table, all the considered sectors (petroleum, education, health, telecommunication and agriculture) increased the GDP of Nigerian economy because they all maintain a positive relationship with the GDP, that means they all go in the same direction with the country's GDP, in other word as they rise, GDP rises and vice-versa. And all have a significant relationship with GDP at 5% level of significant respectively.

CONCLUSIONS

Going by the study, it was observed that the telecommunication sector in recent years and the petroleum sector are the leading income earners among the selected sectors, this is because of governments priority in the oil sector, paying less attention to other sectors of the economy, most especially agricultural sector.

Government should adopt a good policy that will favor and enhance the productivity of each sector and ensure even distribution of its priority to each of the sectors.

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MULTIDIMENSIONAL WELLBEING OF WOMEN IN RURAL SOUTHERN REGION OF NIGERIA

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Abstract

Women are important segment of the human population and constitute critical links between the present generation and the future. Thus investing in their well- being is of great benefit to the society. Therefore this study examined the Multidimensional well-being of women in rural Southern Region, Nigeria. The Nigeria Demographic and Health Survey data was used, 4641 women data from Southern region. Data analysis was done using descriptive statistics and fuzzy analysis. The mean age of women was 34 with a standard deviation of 9. Women in this region have a mean household size of 6 and a standard deviation of 3. The well-being Index for ranges from 0.01 to 0.80 with a mean value of 0.33 and standard deviation of 0.14. Most of the women had their well-being index between 0.00-0.80 while none had very high between 0.81-1.00. In ascending order of contribution, the six dimensions considered are information access, employment, education, nutrition and health, autonomy, housing and sanitation. Women of the South East rank highest in four of the six dimensions considered. These dimensions are employment, health and nutrition, autonomy and information access. The condition of South-South women is best in two dimensions; housing and sanitation, education. The women of South-West zone are worse off than their counterparts in other zones in all the dimensions. South-East women were better off than their counterparts in other zones. Interventions in the area of information access, education, employment, is needed for women in Southern region.

Key words**:** *Nigeria, Southern region, wellbeing, women*

INTRODUCTION

[1] and [10] view well-being as human activities that signify a state of life condition one has attained and experienced; a concept that refers to any assessment in evaluating a person's life situation or 'being', hence, a description of individuals' life situation. Wellbeing is recognized to encompass more than income and consumption to include issues of health, education, security, freedom, social relations and others because of the plurality of human lives. It is a means to an end and an end in itself as well as a basic right of every human being. It is also a critical determinant factor which contributes to economic growth and productivity of every nation. Poverty is an unacceptable human condition and one of the biggest social problems in the twentieth century. It will remain a global problem of huge population - a problem of not having enough resources and abilities to meet human basic needs both as individual and social beings due to its dynamic and multidimensional nature. At the same time, well-being, its' impact on quality of life and relationship with poverty have received substantial attention over the last decades. Both poverty and well-being are interconnected (Laily, 1995). With an increase in income, a great number of needs are satisfied and a higher standard of well-being is achieved. Therefore, it is commonly accepted, a poor person is one whose wellbeing is low [11].

Women play a very vital role in the development of communities and nations. Development is incomplete if it fails to comprehend the contributions of women [4]. They are always at the forefront of a nation's development, thus ensuring their welfare status is good for them, their families and the nation as a whole [6]. Wellbeing among women is determined not only by their health status but also by other social, cultural and economic factors. Although great strides have been made in improving the well-being of women in many

African countries, women still face higher rates of low wellbeing compared to their male counterparts [3].

Over the years, successive governments in Nigeria at various levels have put in place measures and interventions to address this problem.

Despite these interventions, the wellbeing of women in rural Nigeria is still low.

This paper provided answer to this research problem: what is the wellbeing of women in rural Southern region of Nigeria?

MATERIALS AND METHODS

The area of study for this research was Southern region of Nigeria. The southern part is made up of three regions; South-East(SE), South-South (SS) and South-West.

Secondary data from Nigeria Demographic Health Survey NDHS 2013 was used for this study. A total number of 4641 women in rural southern region were sampled and used for this study.

Analytical Procedure

Descriptive statistics and fuzzy set theory were used in this study. The descriptive statistics used include percentages, frequency distribution tables, and the mean.

Fuzzy set Analysis

This was used to estimate the wellbeing status of women. The fuzzy set substitutes the characteristic function of a crisp set that assigns a value of 1 or 0. Large values denote high degree of membership [7], [8].

The degree of wellbeing is shown by the placement of the individual on the 0 or 1 value or other values in-between. The model is considered as follows:

Table 1. Selected Dimensions and Method

Indicator	Selected criteria	Deprivation
Housing and Sanitation		
Source of drinking water	Pipe borne water and treated 1= improved,0= otherwise	0=non deprived,1=deprived
Toilet facility	1= improved,0= otherwise	0=non deprived,1=deprived
Main floor material	1= improved,0= otherwise	0=non deprived,1=deprived
Main wall material	1= use of finished material, 0= otherwise	0=non deprived,1=deprived
Main roof material	1= use of finished product, 0= otherwise	0=non deprived,1=deprived
Autonomy		
Final say on travel to market and outside village/community	Husbands take decisions alone=4 Women and husband take decision =3 Women take decisions with another person = 2 Women take decisions alone = 1	0=non deprived,1=deprived
Final say on own health	Same as above	0=non deprived,1=deprived
Final say on visit to friends and relatives	Same as above	0=non deprived,1=deprived
Final say on making large household purchases	Same as above	0=non deprived,1=deprived
Final say on money spending.	Same as above	0=non deprived,1=deprived
Final say on husband's earnings	Same as above	0=non deprived,1=deprived
Health and Nutrition		
Place of delivery	Deliver in health facility=1.0= otherwise	0=non deprived,1=deprived
Antenatal care	Receive ante natal care from skilled attendant =1, 0 = otherwise	0=non deprived,1=deprived
Skilled attendant during delivery	Attended to by skilled attendant during delivery =1, 0 = otherwise	0=non deprived,1=deprived
Body Mass Index (BMI)	18.5kg/m^2 to 25.0kg/m^2 = 1 <18.5kg/m^2 and >25.0kg/m^2 =0	0=non deprived,1=deprived
Education		
level of educational attainment	woman with no formal education =4 woman with primary education =3 woman with secondary education =2 woman with tertiary education = 1	0=non deprived,1=deprived
Literacy	Women who can read part of a sentence or a whole sentence will be regarded as literate. A value of 1 will be assigned, 0= otherwise	0=non deprived,1=deprived
Employment		
Employment status	Currently employed=1, 0= otherwise	0=non deprived,1=deprived
Employment type	Unemployed = 6 Unskilled manual employment =5 Skilled manual sector = 4 Agricultural and allied sector = 3 Service sector = 2 Professional/Managerial = 1	

Source: own calculation

Assume a population A of n individuals, A = (a_1, a_2, a_3 …a_n). A fuzzy subset B includes all individuals with aiεB.

The degree of wellbeing of the ith individual (i=1,….,n) with respect to a particular attribute j given that (j = 1,……,m) is defined as presented in Table 1.

The variables that define indicators of welfare are either dichotomous or categorical in nature.

$\mu_{\beta|} xj\ (ai\ )| =$ xij, $0 \leq$ xij ≤ 1 1

where:

xij =1; condition of full possession of wellbeing attribute

xij =0; condition of total lack of wellbeing attribute

$0 \leq x_{ij} \leq 1$; conditions within the range of full possession and lack.

RESULTS AND DISCUSSIONS

Socio economic characteristics

In table 2, the mean age of women is 34 with a standard deviation of 9 in SR while in SE(35,8), SS(34,9), SW(34, 9). This implies that we have more middle aged women in rural southern region of Nigeria. This distribution reflects rural urban drift where majority of young people migrate to the urban areas in search of better opportunities.

Table 2. Distribution of women according to Geo-Political Zones in rural Southern Nigeria

Variable	South East		South South		South West	
	Freq.	%	Freq.	%	Freq.	%
Age						
15-24	111	11.70	397	15.69	173	14.90
25-34	318	33.51	947	37.42	434	37.38
35-49	520	54.79	1187	46.90	554	47.72
Mean	35		34		34	
Standard Deviation	8		9		9	
Educational attainment						
No education	51	5.37	261	10.31	312	26.87
Incomplete primary	71	7.48	261	10.31	74	6.37
Complete secondary	297	31.30	544	21.49	221	19.04
Higher	110	11.59	178	7.03	76	6.55
Household size						
1-5	559	58.90	1387	54.80	679	58.48
6-10	367	38.67	1027	40.58	420	36.18
>10	23	2.42	117	4.62	62	5.34
Mean	5		6		6	
Standard deviation	2		3		3	
Marital status						
Single	118	12.43	300	11.85	79	6.80
Married	831	87.57	2231	88.15	1082	93.20
Employment						
Unemployed	168	17.70	406	16.04	97	8.35
Skilled and Unskilled	57	6.01	120	4.74	106	9.13
Agriculture and allied	257	27.08	764	30.19	291	25.06
Services	467	49.21	1241	49.03	667	57.45
Total	**949**	**100**	**2531**	**100**	**1161**	**100**

Source: own calculation

Women that had complete primary education was 26.4% followed by those that had complete secondary education (22.9%). According to the universal basic education that recommends that a girl child should have a minimum of nine years of education, based on this 51.4% of women in the SR are educated. SE zone have the highest percentage of women with tertiary education (11.6%). This is in line with the report of [1] that the highest percentage of women with higher education is found in the SE zone. Women in this region have a mean household size of 6 and a standard deviation of 3.This might be because women in this region are educated. SS and SW region have a mean household size of 6 while SE has a mean of 5. Most of the women are married (89.3%). Women that are employed in the service sector constitute 51.2% followed by those employed in the agriculture and allied sector (28.3%) although some women are still unemployed (14.5%). SS region has the highest percentage of women that are in the agriculture and allied sector (30.2%) and SW has the highest percentage of women employed in the service sector (57.5%).

Multidimensional Well-being of women

Table 3 shows the distribution of rural women based on their Wellbeing Index(WI). The WI for rural women ranges from 0.01 to 0.79 with a mean value of 0.33 and standard deviation of 0.14. Most of the women had their WI between 0.00-0.80 while none had very high between 0.80-1.00. On the average, women in rural Nigeria have low wellbeing index, this is in line with studies using uni-dimensional and multidimensional approach carried out in Nigeria [2] where women are believed to have low wellbeing. Using a multidimensional approach, the result is more pronounced with a larger number of women found to be worse off [1]. The decompositions across geopolitical zones (GPZs) as shown in Table 4 reveal the distribution across zones. In the SE, the highest percentage of rural women falls within 0.20-0.30, in the SS zone, the highest percentage of rural women falls within 0.21-0.30 and in the SW highest percentage of rural women falls within 0.21-0.30.

Table 3.Distribution of rural women by their wellbeing index

Deprivation Index	Frequency	%
0.0000-0.1000	125	2.69
0.1001-0.2000	703	15.15
0.2001-0.3000	1195	25.75
0.3001-0.4000	1161	25.02
0.4001-0.5000	873	18.81
0.5001-0.6000	421	9.07
0.6001-0.7000	143	3.08
0.7001-0.8000	20	0.43
Total	4641	100

Source: own calculation

Table 4. Decomposition of Deprivation Index (DI) across Geopolitical Zones

Category	South East		South South		South West	
	Freq.	%	Freq.	%	Freq.	%
0.000-0.1000	6	0.63	68	2.69	62	5.34
0.1001-0.2000	117	12.33	406	16.04	271	23.34
0.2001-0.3000	332	34.98	679	26.83	275	23.69
0.3001-0.4000	276	29.08	632	24.97	233	20.07
0.4001-0.5000	151	15.91	423	16.71	181	15.59
0.5001-0.6000	52	5.48	210	8.30	111	9.56
0.6001-0.7000	13	1.37	96	3.79	28	2.41
0.7001-0.8000	2	0.21	16	0.63	0	0.00
0.8001-0.9000	0	0.00	1	0.04	0	0.00
0.9001-0.1000	0	0 .00	0.00	0	0	0.00
Total	949	100	2531	100	1161	100

Source: own calculation

The wellbeing status of women is low in the SR. This is supported by the mean (WI) presented in Table 14; while the three zones in southern Nigeria have their wellbeing index (WI) between 0.31-0.33. In addition, in SE, SS and SW the least woman has a WI of 0.08, 0.01 and 0.02 respectively. This agrees with the work of [1]. This implies, there are opportunities to improve on the wellbeing of women in all the zones.

Multidimensional WellbeingDecomposition across Dimensions and Indicators

The contribution of each welfare dimension and indicator to women's wellbeing is presented in Table 5.

Table 5. Multidimensional Wellbeing Decomposition across Dimensions and Indicators

Dimension	Indicators		Weights	Absolute Contribution	Relative Contribution
Housing and Sanitation	Source of drinking water	μ_{11}	0.2857	0.0185	5.5237
	Type of toilet facility	μ_{12}	0.4523	0.0199	5.9588
	Main floor	μ_{13}	0.1666	0.0142	4.2383
	Main wall material	μ_{14}	0.1798	0.0148	4.4357
	Main roof material	μ_{15}	0.0770	0.0080	2.4072
	Type of cooking fuel	μ_{16}	0.6546	0.0181	5.4126
	Electricity	μ_{17}	0.2815	0.0184	5.4959
				0.1118	**33.4722**
Education	Education in single years	μ_{21}	0.3452	0.0194	5.8198
	Educational attainment	μ_{22}	0.2936	0.0186	5.5745
	Literacy	μ_{23}	0.1835	0.0149	4.4885
				0.0531	**15.8828**
Employment	Women currently working	μ_{31}	0.0722	0.0076	2.2828
	Women's occupation(type)	μ_{32}	0.1423	0.0128	3.8285
				0.0204	**6.1113**
Nutrition and Health	Body mass	μ_{41}	0.2354	0.0171	5.1103
	Place of delivery	μ_{42}	04999	0.0197	5.9023
	Ante natal care	μ_{43}	0.8484	0.0150	4.4899
	Assistance during delivery	μ_{44}	1.7689	0.0038	1.1240
				0.0555	**16.6266**
Autonomy	Person who usually decides how to spend respondent's earnings	μ_{51}	0.3418	0.0194	5.8076
	Person who usually decides on respondent's health care	μ_{52}	0.2384	0.0172	5.1397
	Person who usually decides on large household purchases	μ_{53}	0.2699	0.0181	5.4123
	Person who usually decides on visits to family or relatives	μ_{54}	0.3049	0.0188	5.6403
				0.0735	**21.999**
Information Access	Frequency of listening to radio	μ_{61}	0.3770	0.0197	5.9072
				0.0197	**5.9072**

Source: own calculation

Among the six dimensions considered, housing and sanitation had the highest absolute and relative contributions of 0.11 and 33.5% and thus contribute more to wellbeing. This is followed by autonomy with 0.07 and 21.9%. This means that rural women are better off in these dimensions than others. The high relative contribution of housing is expected since most of them live in the same house with their spouses. These houses are provided by the joint effort of the household. It is also worthy of note that autonomy has a high relative contribution. The high relative contribution of autonomy underscores the point that power relations within the household is crucial and ability to participate in decision making particularly with respect to self is important for women's wellbeing.

The lowest absolute and relative contributions of 0.02 and 5.9% respectively are recorded in information access and 0.02 and 6.11 in employment these dimensions contributes less to well-being. It implies that rural women's access to information and employment is poor presently and improving this dimension will improve their wellbeing. In ascending order of contribution, the six dimensions considered are arranged as follows: information access, employment, education, nutrition and health, autonomy, housing and sanitation. In view of the low well-being index of women in general, these dimensions need to be improved on particularly information access, employment, education whose contributions to wellbeing are very low. The Levene's test shows that the variances of multidimensional well- being indices across dimensions are significantly different (ρ= 0.0000).

Decomposition Across Dimensions Housing and Sanitation

In table 6 the SS zone had the highest well-being index of 0.11. With respect to main source of drinking water, it has an index of 0.0189 which is the highest while the lowest is recorded in the SW with 0.0165. On the type of toilet facility, SS has the highest index of 0.0196 while the lowest is recorded in the SW with an index of 0.0167. It shows that the condition of women in the SW is worse off for main source of water and sanitation respectively; when compared to women in other zones. With respect to electricity connection, main floor, wall and roof materials, condition of women in the SW reported the highest index. In all, with regards

to housing and sanitation, women in the SS are better off in this dimension than women in other zones in the SR of the country.

Education

The SS women emerged with the highest index in this dimension. The zones arranged from the descending order with respect to educational attainment are SS, SW and SE.

Employment

The South East women had the highest level of well-being in this dimension and have the highest WI of 0.0101 in women currently working and a 0.0148 value for employment type. This result is not unexpected as people from this zone are widely known for their business prowess. However, SW women were worse off in this dimension of well-being.

Health and Nutrition

Health and nutrition was assessed considering the antenatal care, skilled assistance during delivery, place of delivery and body mass index of respondents. The result shows that women in the SE had the highest wellbeing index while women from the SW were worse off.

Autonomy

Women in SE enjoyed the highest level of autonomy. On the contrary, the results reveal that women in SW are worse off in this dimension. These results indicate that conditions of SW women are worse off with regards to how to spend money, final say on large household purchases.

The implication of this is that women in the SW are likely to depend on their husband's decision or take decisions jointly with them or other relatives because they possess the lowest WI in relation to two of the indicators examined to determine their level of autonomy. SS also has the least index with respect to autonomy on their health and visit to friends and family members.

This indicates that these women seek the approval of their husbands or other people on decisions pertaining to their health and before they embark on visit to friends and family members.

Table 6. Multidimensional Welfare Deprivation Decomposition across Geopolitical Zones

Attribute	South East	South South	South West	All zones
Housing and Sanitation	**0.0975**	**0.1125**	**0.1063**	**0.1118**
	30.4349	**34.8815**	**34.6148**	**33.4722**
Main source of drinking water source	0.0179 (5.5844)	0.0189 (5.6833)	0.0165 (5.3677)	0.0185 (5.5237)
Type of toilet facility	0.0194 (6.0664)	0.0196 (5.9189)	0.0167 (5.4363)	0.0199 (5.9588)
Main floor material	0.0124 (3.8638)	0.0139 (4.2099)	0.0146 (4.7503)	0.0142 (4.2383)
Main wall material	0.0103 (3.2032)	0.0149 (4.4876)	0.0159 (5.1869)	0.0148 (4.4357)
Main roof material	0.0059 (1.8278)	0.0075 (2.2691)	0.0099 (3.2111)	0.0080 (2.4072)
Type of Cooking fuel	0.0154 (4.8338)	0.0189 (5.6938)	0.0157 (5.1082)	0.0181 (5.4126)
Has Electricity connection	0.0162 (5.0554)	0.0125 (4.1206)	0.0170 (5.5542)	0.0184 (5.4126)
Education	**0.0444**	**0.0531**	**0.0521**	**0.0531**
	13.8392	**16.0220**	**16.9777**	**15.8828**
Education in single years	0.0175 (5.4604)	0.0195 (5.8708)	0.0181 (5.8863)	0.0194 (5.8198)
Women educational attainment	0.0177 (5.5260)	0.0184 (5.5412)	0.0179 (5.8194)	0.0186 (5.5745)
Literacy	0.0091 (2.8528)	0.0153 (4.6099)	0.0162 (5.2721)	0.0149 (4.4885)
Employment	**0.0249**	**0.0213**	**0.0141**	**0.0204**
	7.7668	**6.4118**	**4.5776**	**6.1113**
Women currently working	0.0101 (3.1432)	0.0082 (2.4586)	0.0042 (1.3802)	0.0076 (2.2828)
Women's occupation(type)	0.0148 (4.6236)	0.0131 (3.9531)	0.0098 (3.1975)	0.0128 (3.8285)
Health	**0.0572**	**0.0543**	**0.0496**	**0.0555**
	17.8536	**16.3886**	**(16.1732)**	**16.6266**
Body mass	0.0184 (5.7467)	0.0172 (5.1767)	0.0148 (4.8281)	0.0171 (5.1103)
Place of delivery	0.0207 (6.4825)	0.0179 (5.4035)	0.0180 (5.8676)	0.0197 (5.9023)
Ante natal care	0.0157 (4.8926)	0.0147 (4.4473)	0.0141 (4.5780)	0.0150 (4.4899)
Assistance during delivery	0.0023 (0.7319)	0.0045 (1.3611)	0.0028 (0.8995)	0.0038 (1.1240)
Autonomy	**0.0762**	**0.0707**	**0.0681**	**0.0735**
	23.7795	**21.3218**	**22.1912**	**21.999**
Final say on women's earning	0.0183 (5.7028)	0.0186 (5.6051)	0.0171 (5.5865)	0.0194 (5.8076)
Final say on women's health	0.0195 (6.0700)	0.0161 (4.8572)	0.0164 (5.3419)	0.0172 (5.1397)
Final say on large household purchases	0.0184 (5.7336)	0.0181 (5.4635)	0.0166 (5.3955)	0.0181 (5.4123)
Final say on visit to family and friends	0.0201 (6.2730)	0.0179 (5.3959)	0.0180 (5.8673)	0.0188 (5.6403)
Information access	**0.0203**	**0.0197**	**0.0168**	**0.0197**
	(6.3259)	**(5.9289)**	**5.4655**	**5.9072**
Frequency of listening to radio	0.0203 (6.3259)	0.0197 (5.9289)	0.0168 (5.4655)	0.0197 (5.9072)
Total	**0.3205**	**0.3315**	**0.3069**	**0.3341**

Source: own calculation

Information Access

There is one indicator under this dimension, frequency of listening to radio. With regards to frequency of listening to radio, women in the SE have the highest WI of 0.0203. On the contrary, women in the SW have the least. The absolute and relative contributions of this dimension to wellbeing reveals that the women in SE have the highest contribution while those in the SW zone have the least

In all, women of the SE rank highest in four of the six dimensions considered. These dimensions are employment, health and nutrition, autonomy and information access. The condition of SS women is best in two

dimensions; housing and sanitation, education. The women of SW zone are worse off than their counterparts in other zones in all the dimensions. Finally, considering all the six dimensions, condition of women in the South East is best. The Levene's test shows that the variances of multidimensional wellbeing indices across GPZs in Nigeria are significantly different (= 0.0000).

Decomposition across socio-economic groups

In figures 1-4, the decomposition of WI across socio-economic characteristics of rural women is presented. These characteristics are age, household size, gender of household head, and educational attainment. The decomposition by age group presented in figure 1 shows that middle aged women within the age group of 25 to 34 years have higher WI compared to other age groups.

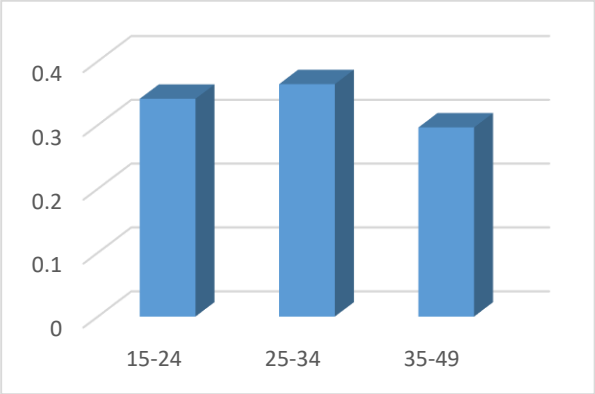

Fig 1. Multidimensional welfare deprivation decomposition across age groups
Source: own calculation

With respect to household size (figure 2), the subgroup belonging to small household size (1 to 5) has higher WI than other groups.

This subgroup has 0.34 WI, followed by those with 6 to 10 household size with 0.33 WI. The results reveal a negative relationship between wellbeing and household size, indicating that it increases as size of the household decreases. This is understandable since smaller households reduce the number of people to be cared for and enable members to have a better share of the household resources. This buttresses the fact that small household size reduces dependency ratio, hence enhancing wellbeing.

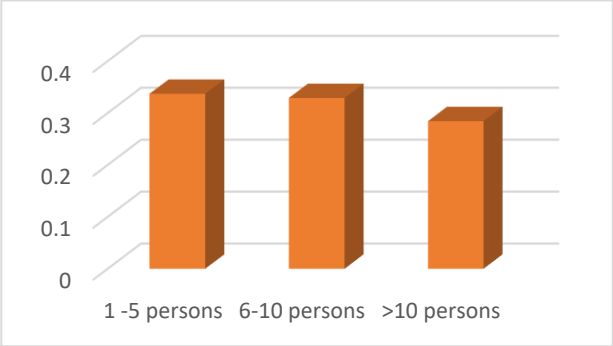

Fig. 2. Multidimensional welfare deprivation decomposition across household size
Source: own calculation

In figure 3, the wellbeing indices of women in male and female headed households are 0.33 and 0.32 respectively. Women in male headed household have a higher WI than those in female headed households. This is in line with [9] who find out that the WI for male headed household is 1.48% greater than that of female headed household.

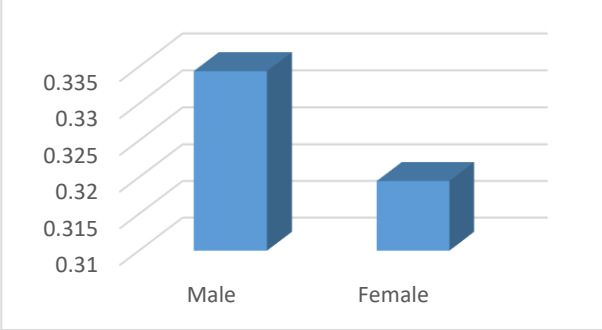

Fig. 3. Multidimensional welfare deprivation decomposition by gender of household head
Source: own calculation

The wellbeing indices across educational groups increase from no education to complete primary and decreases across other educational groups. (figure 4). The peak is attained by the group with complete primary while the least is recorded in the group with no education. The completion of primary school education is the minimum required to have a wellbeing index above 0.40.

In summary, middle aged women with primary education from a small sized male headed household have higher wellbeing indices than other groups.

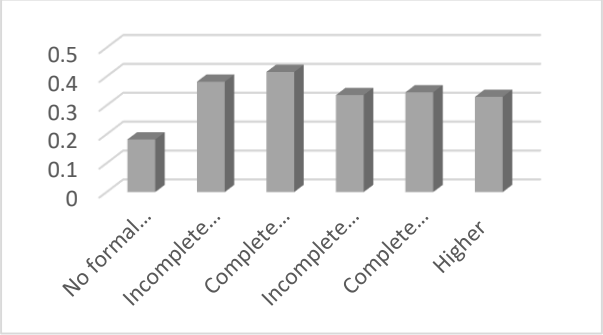

Fig. 4. Multidimensional Welfare Deprivation Decomposition by Educational Attainment
Source: own calculation

The Levene's test show that the variances of multidimensional wellbeing indices across socio-economic characteristics of rural people are significantly different (= 0.0000).

CONCLUSIONS

This study provides empirical evidence of the well-being of women in the Southern region. Women in the South East were better off than their counterparts in other zones. Interventions in the area of information access, education, employment, is needed for women in SR especially women in the South West. Governments and Non-Governmental organizations should put in place interventions in these dimensions so that the Sustainable Development Goals put in place by the United Nations can be achieved by 2030.

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INFLUENCE OF SOIL AND CLIMATE CONDITIONS AND TECHNOLOGICAL CHAINS ON SOME QUALITY INDICATORS AND PROFITABILITY IN PREMIUM WHEAT VARIETIES

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Abstract

Wheat is the most important cereal plant cultivated on largest surfaces due to its importance as a human food and also for animal feeding. Wheat has a high content of carbohydrates and proteins and a balanced the ratio between these items. Wheat quality is determined by the qualities of gluten such as: viscosity, elasticity, extensibility, resistance to action of the proteolytic ferments in the fermentation process, etc.. Besides production, which is the quantitative indicator, the protein content of the grains is the most important qualitative factor which gives the value of the utilized output. For this reason, this paper aimed to study the behaviour of six Premium Wheat varieties with early precocity in the soil and climate conditions of Calarasi area,Romania, during 2016. The analysis was focused on some qualitative indicators as follows: the content of protein and gluten, the hectolitre weight and the mass of 1,000 grains. All the determinations proved a high quality of grains and also the production performance of all the six Wheat varieties used in this study.

Key words**:** *quality, gluten, protein, produce, variety*

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INTRODUCTION

Wheat is the most important grown plant with a high food proportion[3] The large areas on which it is sown, as well as the attention that the plant enjoys, is due to the high content of grains in carbonated carbohydrates and proteins and the ratio of these substances to the requirements of the human body; long consistency of grains and the fact that they can be transported without difficulty [7]. Agronomically speaking, wheat crop offers the advantage that it is fully mechanized [8]. At the same time, wheat is a very good precursor for most crops, because it leaves the field early and allows ploughing to be done even during summer [9].

Wheat quality is due to the quality of gluten (viscosity, elasticity, extensibility, resistance to proteolytic fermentation in the fermentation process, etc.)[10]. After production, which is the quantitative indicator, the protein content of the grain is the most important quality factor that gives the harvesting value [1].

The content in wet gluten is dependent on the protein content of the grains, being an indicator of particularly important quality, which determines the quality class of the harvest obtained [4].

Premium grains are known in Germany as "E" type grains. Various varieties are produced and originally produced in Eastern Austria in the Pannonian Plain, in climatic conditions very similar to those in South-East and West Romania, multi-annual average rainfall of 450-500 mm and multiannual average temperatures exceeding 22°C in July and -2 ... -3°C in January (the average of 1971-2000). The multiannual average temperature in the Eastern area, where varieties have been improved, is +11°C. Thus, the identity of the climatic conditions in the area of improvement with those in the grown areas in Romania [6] is observed.

Premium wheat varieties have a number of features based on which they are included in this class [5]. The most important parameter is their quality, they all have a high protein

content, they have a profound and bulky radicular system, a good water and nutrient utilization capacity, and very good twinning and require a small amount of seed (150 Kg/ha), plant height is high; they are varieties particularly resistant to drought and they are recommended to grow in dry areas, they are particularly resistant to frost (-30°C); they have high resistance to rust and flour; they shows high resistance to fall [2].

MATERIALS AND METHODS

The researches focused on the study of the behavior in the crop (profitability) in soil and climate conditions in Călăraşi area, during 2016, six wheat varieties of Premium group, as well as the analysis of some qualitative indicators (the content in protein and gluten, hectoliter weight and meal of ,000 grains). The researches were carried out on three variants, each variant having three repetitions, the surface of the experimental plots being 150 square meters.

Six wheat varieties with early precociousness were studied, as shown in Table 1, Josef variety being chosen as control, for the results comparison.

Table 1. Experimental variants

Variant	Variety
V1	MIDAS
V2	BITOP
V3	FULVIO
V4	ATRIUM
V5	ARNOLD
V6	JOSEF-**Mt**

Source: Own experiment.

The type of soil encountered in Calarasi county is chernozem. The climate regime is characterized by very hot summers and relatively cold winters with snow storm periods. During the year 2016, the recorded precipitations were 811.6 mm, the largest quantities being recorded during the months of May, June and August, exceeding the monthly multiannual averages (Table 2). Also, the annual average of temperatures was higher compared to the multi-annual average of 1981-2010.

The technology used was in the scarification work followed by a disk work simultaneously with the DAP fertilizer work. Sowing took place on October 10th. Chemical fertilizers NH4NO3 were also administered at a dose of 200 kg in March and 200 kg DAP in April. Phyto-sanitary treatments were performed with Biscaya insecticide, Menara fungicide and Floramix herbicide.

Table 2. Temperatures and precipitations recorded during the year 2016

month		**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**Precip.**
2016	**P mm**	62.6	35.6	67.8	64.6	71.0	114.8	4.2	88.8	83.2	164.2	51.8	3.0	**811.6**
	T °C	-5.6	3.2	7.6	14.3	15.9	22.4	24.2	23.1	18.9	9.7	5.3	-2.1	10.7
Average 1981-2010	**P mm**	33.6	31.6	38.3	51.3	66.5	84.5	77.8	64.7	55.0	43.5	41.5	44.8	**633.1**
	T °C	-2.1	-1.0	3.5	9.3	14.9	18.3	20.2	19.7	14.8	9.6	3.8	-0.8	9.8

Source: Calarasi Meteorological Station.

RESULTS AND DISCUSSIONS

As shown in the data presented in table 3, protein content ranges between 13.7% and 15.9%. The lowest content was recorded at the 4 - Atrium variant, with a difference of - 1.5% compared to the control and -0.9% compared to the average of the six variants, 14.6%. The highest value was obtained at the 5- Arnold variant, 15.9%, the only one that exceeded the control value, of 15.2% (Josef variety), recording an increase of 1.3% compared to the average. Except for the Midas and Atrium varieties, all other varieties in the study recorded values of protein content of over 14%.

The gluten content was over 28% for all six variants analyzed, reaching a maximum of 31.8% for variant 2, Bitop variety. The lowest percentage was recorded for variants 4 - Atrium variety and 6 - Josef, 28.7%, which were also the variants that made a minus compared to the average (-1.2%).

Table 3. Influence of soil and technological chains on the protein and gluten content

No. crt.	Variety	Content in protein	Dif. Compared to Mt %	Dif. Compared to average %	Content in gluten %	Dif. Compared to Mt %	Dif. Compared to average %
1	Midas	13.8	-1.4	-0.8	29.8	+1.1	-0.1
2	Bitop	14.7	-0.5	+0.1	31.8	+3.1	+1.9
3	Fulvio	14.2	-1.0	-0.4	29.7	+1.0	-0.2
4	Atrium	13.7	-1.5	-0.9	28.7	0	-1.2
5	Arnold	15.9	+0.7	+1.3	30.5	+1.8	+0.6
6	Josef-**Mt**	15.2	-	+0.6	28.7	-	-1.2
7	**Average**	**14.6**			**29.9**		

Source: Own determinations

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Table 4. Influence of soil and technological chains on some quality indices

No. crt.	Variety	Hectoliter weight %	Dif. Compared to Mt %	Dif. Compared to average %	Mass 1000 grains g	Dif. Compared to Mt g	Dif. Compared to average g
1	Midas	78.4	+3.3	-0.2	40.72	+3.82	+1.75
2	Bitop	80.8	+5.7	+2.2	43.06	+6.16	+4.09
3	Fulvio	78.2	+3.1	-0.4	35.44	-1.46	-3.53
4	Atrium	79.7	+4.6	+1.1	40.36	+3.46	+1.39
5	Arnold	79.4	+4.3	+0.8	37.32	+0.42	-1.65
6	Josef-**Mt**	75.1	-	-3.5	36.90	-	-2.07
7	**Average**	**78.6**			**38.97**		

Source: Own determinations

The data in Table 4 reflects the value of the hectoliter weight and MMB of the experienced varieties. It is remarked that 2-Bitop variant with the highest hectoliter weight, 80.8%, with an increase of 5.7% compared to control and 2.2% compared to the average of the six studied varieties. The lowest value was obtained at variant control - Josef variety, 75.1%. All other varieties recorded values above 78%, their average being above this value (78.6%).

With respect to 1,000 grains, its values ranged between 36.90 grams, in the variant 6 - Josef and 43.06 grams in the variant 2- Bitop, with an average value of 38.97 grams.

As it can be seen from the data presented in table 5, the profitability obtained in soil and climate conditions of the year 2016 recorded values between 6,492 kg/ha, at variant 6-Josef and 8,158 kg/ha, in variant 1-Midas variety. The profitability of the other analyzed varieties exceeded 7,000 kg/ha, the average value being

7,465 kg/ha. The highest crop was recorded in the variant 1- Midas variety, 25.7% compared to control, namely, a very significant crop increase of 1,666 kg/ha. This variety also produced the only significant production difference (693 kg/ha) compared to the average (7,465 kg/ha). On the second place, from this point of view, 2 variant ranged, with a production of 7,673 kg/ha, was 18.2% higher than the control and an addition of 1,181 kg / ha, which was quoted as very significant. Compared to the average, the increase achieved by this variety was distinctly significant with a value of 208 kg/ha.

Compared to control, all studied varieties recorded very significant crop increases. Compared to the production average, variant Fulvio 3 variant and Atrium 4 did not get any significant differences. Compared to the production average of the six varieties, 7,465 kg/ha, variant 5 - Arnold and 6 - Josef made very significant harvest minuses, resulting in production differences of 973 kg/ha and 405 kg/ha, which in relative values materializes in a minus production of 5.4 until 13%.

Table 5. Influence of soil on Premium wheat production in the year 2016

No. crt.	Variety	Production kg/ha	Difference cmpared to Mt %	Difference compared to Mt kg	Signifi cance	Difference compared to average %	Difference comapred to average kg	Signifi cance
1	Midas	8,158	+25.7	+1,666	***	+9.3	+693	***
2	Bitop	7,673	+18.2	+1,181	***	+2.8	+208	**
3	Fulvio	7,537	+16.1	+1,045	***	+1.0	+72	-
4	Atrium	7,476	+15.2	+984	***	+0.1	+11	-
5	Arnold	7,060	+8.7	+568	***	-5.4	-405	000
6	Josef-**Mt**	6,492	Mt	Mt		-13.0	-973	000
7	**Average**	**7,465**				Mt	Mt	

Dl5%=106.61 kg/ha Dl1%=151.56 kg/ha Dl0.1%=219.45 kg/ha
Source: Own determinations

CONCLUSIONS

Under soil, but especially climate conditions of the year 2016 and the technology used, Premium wheat varieties tested had values of protein content between 13.7% and 15.9%. The average value of the six analyzed varieties was 14.6%. The lowest protein content was recorded in the 4- Atrium variant, 13.7% and the highest in 5 Arnold variant, 15.9%. Arnold variety was the only one to exceed the protein content of control (15.2%). Variants 2-Bitop, 5- Arnold and 6-Joseph obtained protein content values that exceeded the calculated average value of the varieties. Concerning gluten content of varieties, the average value was 29.9%, surpassed only by the variant 2-Bitop and the Arnold variety. Bitop variety was the variety that also recorded the highest content in gluten, 31.8%. As a witness, all varieties studied added a gluten content of between 1 and 3.1%.

In terms of hectoliter weight values, the highest value, 80.8%, was recorded in the 2- Bitop variant. All the studied varieties exceeded the value of hectoliter weight recorded by control, (75.1%), the recorded increase being between 3.3 and 5.7%. All recorded values were over 78%.

The mass of one thousand grains had the lowest value, 35.44 g, for Fulvio 3-variant and the highest, 43.06 g, for 2- Bitop variant.

Regarding the profitability obtained by the studied varieties, it overcome in all variants the production of control, the differences being very significant and consisted in crop profitability ranging from 568 to 1,666 kg/ha. The highest production was recorded in Midas 1 variant, 8,158 kg/ha and the lowest at Arnold 5 variant, 7,060 kg/ha. As compared to average production, the 1 variant Midas obtained the highest crop profitability, 693 kg/ha, a very significant increase.

Compared to the production average, Fulvio 3 variant and Atrium 4 variant did not show any

significant differences. Compared to the production average of the six varieties (7,465 kg/ha), 5 variant Arnold and 6 variant Josef made very significant harvest minuses, resulting in production differences of 973 kg/ha and 405 kg/ha, which means, in relative values, a minus production of 5.4 to 13%.

All the studied variants have confirmed the excellent value of the varieties regarding some qualitative indices but also regarding the recorded productions.

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ASSESSING RELATIONSHIP BETWEEN SELECTED CLIMATE VARIABLES, HUMAN DISEASES AND CROP PRODUCTION USING ARDL APPROACH – THE EXAMPLE OF ONDO STATE, NIGERIA

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Abstract

This study was designed to investigate the relationship between crop production and selected climatic variables and human diseases in Ondo State, Nigeria. Time series data spanning 32 years (1982 to 2013) were used for this study. The analytical tools employed for this study were descriptive statistics and auto-regressive distributed lag (ARDL) model. The results confirmed the presence of long run equilibrium between crop production and temperature, rainfall, incidence of malaria and incidence of pneumonia. The results of long run estimates showed that rainfall and pneumonia coefficients were significant but negatively affected crop production in the long run, while all the variable except temperature were also significant but negatively affected crop production in the short run. The error correction model (ECM) value of -0.142 which was significant at 5% level showed that about 14% of disequilibria from the previous year's shock converge to the long run equilibrium in the current year. Therefore, disease prevention and environmental sanitation under the framework of the primary health care programme that can reduce human exposure to climate–related health risks should be strengthened by the government.

Key words**:** *Climate change, crop, diseases, health, production*

INTRODUCTION

Many evidences in the literature [10][6][9][7] reported that climate change will hit developing countries the hardest. Its effect in terms of higher temperatures, changes in rainfall patterns, rising sea levels and frequent occurrence of weather-related disasters which cause great threats to agriculture, food and water supplies. At stake are recent gains in the fight against poverty, hunger and diseases, and the lives and livelihoods of billions of people in developing countries, Nigeria inclusive [11]. It has been reported by WHO that climate change affects social and environmental determinants of health such as clean air, safe drinking water, sufficient food and secure shelter. Extremely high air temperatures contribute directly to deaths from cardiovascular and respiratory diseases in which over 70,000 deaths were recorded in the heat wave of summer 2003 in Europe [29]. It was also documented that pollen and aeroallergen levels as a result of extreme heat has increased asthma, affects about 300 million people while urban air pollution causes about 1.2 million deaths every year. Since the 1960s, weather-related disasters have been accounted for over 60,000 deaths, mainly in developing countries. With the rising sea levels and increasing weather disasters, many homes, farms, properties/assets and other essential services have been distrupted and destroyed most especially in the rural communities even here in Nigeria.

According to [20] and [30], extreme weather events amplifies the spread of pests and diseases, and increased in ailments such as meningitis, measles, chicken pox, malaria, dengue, asthma, cryptospordiosos, giardiasis,

typhoid fever and other infections. There is no doubt from the literature that the changes in global climate patterns will affect all people and countries but what will be the fate of developing countries such as Nigeria and the farmers who depend mainly on rain-fed agriculture and as well referred to as most vulnerable in the struggle? Nigeria depends solely on agarian farming/agriculture who can not but practice activities that will provoke the ill consequence of climate change.

Recent evidences revealed that climate change will exacerbate the burden of climate sensitive diseases such as heat-related illnesses, injuries from extreme events, respiratory diseases, vector-borne diseases and other infections [16][21] and [22]. In Nigeria and other Sub-Saharan countries, the incidences of climate sensitive diseases have been on the increase [30]. According to [13], over 200 people were killed by meningitis within one week in the early 2009 in Nigeria and Niger Republic. There were outbreaks in 76 areas, 25,000 suspected cases and 1,500 deaths in the first quarter of 2009.

According to [31], about 3.3 billion people – half of the world's population – are at risk of malaria. In 2010, there were about 219 million malaria cases (with an uncertainty range of 154 million to 289 million) and an estimated 660,000 malaria deaths (with an uncertainty range of 490,000 to 836,000). Malaria is said to be responsible for about 66 per cent of all clinic visits in the country [14] and 30 percent of hospital admissions. It also accounts for 25 per cent of deaths in children under one year old; and 11 per cent of maternal deaths —a heavy burden on Nigeria's families, communities, health system, and workforce including farmers. Respiratory diseases are a major cause of mortality and morbidity worldwide especially in most developing countries including Nigeria [2][19]. Amongst these respiratory diseases, pneumonia is the leading cause of death worldwide. It was reported that it causes death of an estimated two million children every year, even more than AIDS, malaria, and measles combined [28]. Approximately 150 million new cases of pneumonia occur annually among children younger than 5years worldwide accounting for approximately 10 to 20 million hospitalizations [12] and [14].

Therefore, the researchers deem the study important by expanding the frontier of knowledge about the effect of climate change and variability on the productivity of crop farmers by the inclusion of disease factors. It will profer likely ways to abate the negative impacts of climate change to crop production and farmers' health. The study examines the relationship that exists among selected climatic variables, human diseases and crop output spanning from 1982 to 2013.

MATERIALS AND METHODS

The Study Area

This study was carried out in Ondo State, Nigeria. The State is located in the Southwestern part of Nigeria. It has 18 Local Government Areas (LGAs) as shown in Figure 1, with a population of about 3,440,000 of which the rural population constitutes about 1.7 million and land area of 14,606 km^2 [15]. The State is situated between longitudes $4^0\ 15^1$ E and $6^0\ 00^1$E of the Greenwich meridian and latitudes $5^0\ 45^1$N and $7^0\ 45^1$ N. It has a tropical wet-and-dry climate with average annual rainfall of about 1500mm and 2000mm in the derived savannah and humid forest zones respectively [18] with a high daily temperature of about 30^0C. The climate of the area is highly favoured for the agrarian activities of her teeming population. About 75% of the population is engaged in farming who grow both cash and food crops. The main cash crops are cocoa, oil palm, rubber, cashew and kola nut, while the food crops are maize, cassava, yam, plantain and vegetables

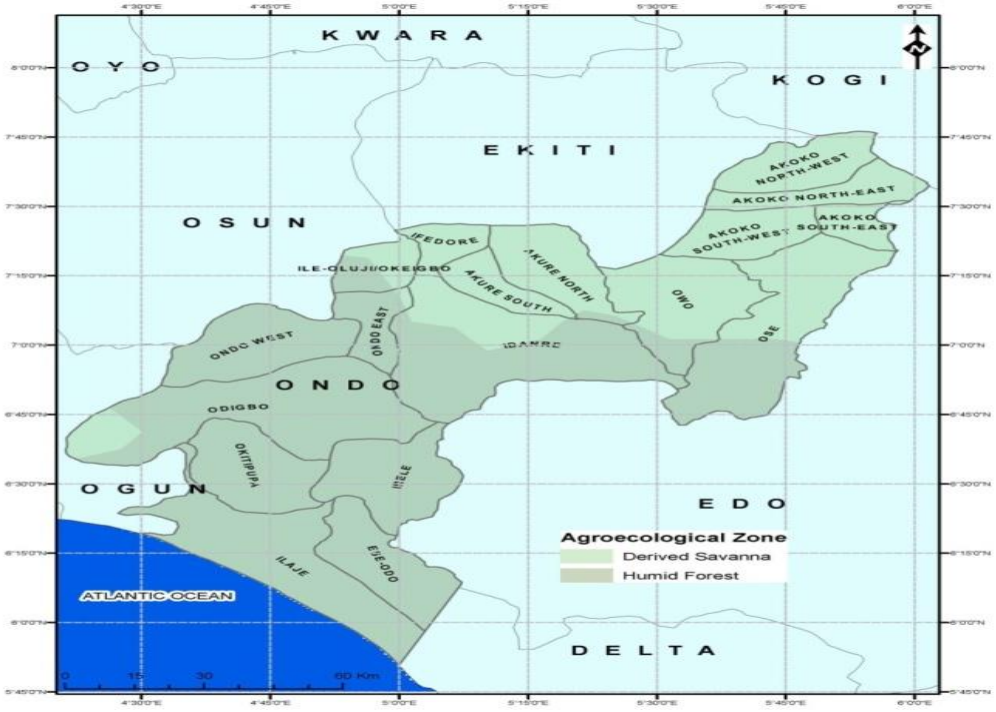

Figure 1. Agro-ecological Zones in Ondo State
Source: Adopted from [18].

Data sources and Description

Secondary data were collected on climate variables (temperature and rainfall), selected climate sensitive diseases (malaria and pneumonia) and crop production spanning the time period 1982 to 2013. The climatic variable data were sourced from the National Bureau of Statistics (NBS) and Agro-Climatological and Ecological Department, Ondo State Ministry of Agriculture. Also, data on crop output/production were sourced from the National Bureau of Statistics (NBS) and Ondo State Agricultural Development Programme (ADP). Data on climate sensitive diseases (malaria and pneumonia) were sourced from the National Bureau of Statistics (NBS) and Ondo State Ministry of Health.

Data Analysis and Model Specification

This study employed the autoregressive distributed lag (ARDL) bounds testing approach to cointegration proposed by [26]. Despite the fact that this technique can avoid unit root test, it is also germane to perform stationarity test to make sure that the assumption of ARDL (i.e. regressors are integrated of *I(1), I(0)* or mutually) is not violated. This is because the model will crash in the presence of *I(2)* series. Therefore, the stationarity status of all the variables was determined by Augmented Dickey Fuller (ADF) test. The model is as follows:

Constant term: $\Delta P_{it} = \alpha_1 + \varphi P_{it-1} + \sum_{i=1}^{n} \theta_i \Delta P_{it-1} + \varepsilon_{it}$ .....(1)

Constant term and Trend: $\Delta P_{it} = \alpha_1 + \alpha_{2t} + \varphi P_{it-1} + \sum_{i=1}^{n} \theta_i \Delta P_{it-1} + \varepsilon_{it}$ ..... (2)

where Δ is the first difference operator; P_{it} is variables being investigated for stationarity; α, φ, θ are parameters to be estimated; n is number of lag of the variables to be included; ε_{it} is the error term.

The null hypothesis of the ADF unit root test is $H_0: \delta = 0$ which implies that the series is not stationary and the alternative hypothesis is $H_a: \delta < 0$ which indicates that the series is stationary. If the absolute value of calculated ADF statistic is higher than the absolute value of the critical values, we reject the null hypothesis which indicates that the series is stationary. However, if this value is lower than the critical values, we cannot reject the null hypothesis which indicates that the time series is not stationary [8].

Furthermore, unrestricted vector autoregression (VAR) by lag selection criteria was used to determine the optimal lag for the model. Akaike Information Criterion (AIC), Schwarz's Bayesian Information Criterion (SBIC) and Hannan-Quinn Information Criterion (HQIC) were used for the VAR models. The model with the lowest value of estimated standard errors was chosen for the study. Their formula is stated as:

$AIC = \ln(\in^2) + {}^{2K}/_{T}$ ..... (3)

$SBIC = \ln(\in^2) + {}^{K}/_{T}\, lnT$ ..... (4)

$HQIC = \ln(\in^2) + {}^{2K}/_{T}\, lnT$ ..... (5)

Where *ln* is the natural log; $\in^2$ is the variance of the estimated residuals; K is the sample size; T is the number of parameters.

Finally, the study employed the autoregressive distributed lag (ARDL) model (bounds testing procedure) to examine the cointegration (long run) relationship between crop production and its determinants (Temperature, Rainfall, Malaria and pneumonia) as well as the short run dynamics. The bound test is basically computed based on an estimated error correction version of autoregressive distributed lag (ARDL) model, by Ordinary Least Square (OLS) estimator [26].

An F-test of the joint significance of the coefficients of the lagged levels of the variables was used to test the hypothesis of no cointegration among the variables against the presence of cointegration among the variables. The null hypothesis of no cointegration (no long-run relationship) among crop production, temperature, rainfall, malaria and pneumonia were given as:

$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

The alternate hypothesis (there is long-run relationship or cointegration exists) was given as:

$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$

The F-test has a nonstandard distribution irrespective of whether the variables are *1(0)* or *1(1)*. [26] put forward two sets of adjusted critical values that provides the lower and upper bounds used for inference. One set assumes that all variables are *1(0)* and the other assumes that they are all *1(1)*. If the computed F-statistics falls above the upper bound critical value, then the null of no cointegration is rejected. If it falls below the lower bound, then the null hypothesis is accepted. Finally, if it falls between the lower and upper bound, then the result would be inconclusive. The optimal lag length for the specified ARDL model was determined based on the SBIC.

Model Specification:

The relationship among crop production (*CP*), temperature (*TP*), rainfall (*RF*), malaria (*ML*) and pneumonia (*PN*) is expressed implicitly as:

$lnCP = f(lnTP,\ lnRF,\ ln\,ML,\ lnPN)$ ….. (6)

The variables were transformed and measured in their natural logarithm (*ln*) for easy interpretation of coefficients in standardized form of percentage as equally observed by [3]. Following [26], the ARDL model specification of equation (6) was expressed as Unrestricted Error Correction Model (UECM) to test for cointegration between the variables under study:

$$\Delta lnCP = \beta_0 + \sum_{i=1}^{q} \beta_1\, \Delta lnCP_{t-i} + \sum_{i=0}^{q} \beta_2\, \Delta lnTP_{t-i} + \sum_{i=0}^{q} \beta_3\, \Delta lnRF_{t-i} + \sum_{i=0}^{q} \beta_4\, \Delta lnML_{t=i} + \sum_{i=0}^{q} \beta_5\, \Delta lnPN_{t=i} + \omega_1 lnCP_{t-1} + \omega_2 lnTP_{t-1} + \omega_3 lnRF_{t-1} + \omega_4 lnML_{t-1} + \omega_5 lnPN_{t-1} + e_t \quad \text{.....(7)}$$

Once cointegration was established, the long run relationship was estimated using the conditional ARDL model specified as:

$$lnCP_t = \beta_0 + \omega_1 lnCP_{t-1} + \omega_2 lnTP_{t-1} + \omega_3 lnRF_{t-1} + \omega_4 lnML_{t-1} + \omega_5 lnPN_{t-1} + e_t \quad \text{… … … (8)}$$

The short run dynamic relationship was estimated using an error correction model specified as:

$$\Delta lnCP_t = \beta_0 + \sum_{i=1}^{q} \beta_1\, \Delta lnCP_{t-i} + \sum_{i=0}^{q} \beta_2\, \Delta lnTP_{t-i} + \sum_{i=0}^{q} \beta_3\, \Delta lnRF_{t-i} + \sum_{i=0}^{q} \beta_4\, \Delta lnML_{t-i} + \sum_{i=0}^{q} \beta_5\, \Delta lnPN_{t-i} + \delta ecm_{t-1} + e_t \quad \text{… … … … … … … … … (9)}$$

Where:

CP = Crop production in metric tons ('000MT)

TP = Average Temperature in degree celcius (^{0}C)

RF = Rainfall in millimeter (mm)

ML = Malaria count/incidence (number)

PN = Pneumonia count/incidence (number)

ln = natural log

β_0 = Constant term

e_t = White noise

$\beta_1 - \beta_5$ = Short run elasticities (coefficients of the first-differenced explanatory variables)

$\omega_1 - \omega_5$ = long run elasticites (coefficients of the explanatory variables)

ecm_{t-1} = Error correction term lagged for one period

δ = Speed of adjustment

Δ = First difference operator

ln = Natural logarithm

q = Lag length

ARDL Diagnostic Tests: All the estimated ARDL model coefficients were subjected to diagnostic tests for their reliability under both the Langrange Multiplier (LM) version and F-version tests. Although both versions of the test have the same asymptotic distribution, the F version is preferred to the LM version in small samples on the basis of Monte Carlo simulations [25][3]. Following [3], the F version was employed in this study.

RESULTS AND DICUSSIONS

Summary Statistics of Variables Used in ARDL Model

Table 1 shows the summary statistics of crop output, incidence of malaria, amount of rainfall, pneumonia and average temperature from 1982 to 2013. All the variables were positively skewed expect temperature while the Jarque-Bera coefficients were significant under crop output, malaria count and temperature with 1%, 5% and 1% level respectively.

Table 1. Summary Statistics of ARDL Approach Variables

Statistic	Crop Output	Malaria count	Rainfall	Pneumonia	Temperature
Mean	359019.0	54565.33	119.9994	699.6406	25.82891
Median	236209.0	39664.21	117.7250	604.5000	26.09250
Maximum	896000.0	184253.0	151.7000	2015.000	26.90000
Minimum	205000.0	4724.000	90.10000	23.00000	21.51500
Std. Dev.	237286.5	45966.48	15.56421	623.7619	0.964390
Skewness	1.535793	1.215173	0.178692	0.544284	-3.031596
Kurtosis	3.542365	3.556185	2.804150	2.125019	13.82398
Jarque-Bera	12.97173	8.287894	0.221441	2.600761	205.2277
Probability	0.001525	0.015860	0.895189	0.272428	0.000000
Sum	11488609	1746091.	3839.980	22388.50	826.5250
Sum Sq. Dev.	1.75E+12	6.55E+10	7509.588	12061446	28.83149
Observations	32	32	32	32	32

Source: Computed from Field Survey Data, 2014.

Unit Root Tests Analysis

Despite the fact that ARDL cointegration technique does not require pre-testing of variables included in the empirical model for the order of integration [17], it has also been reported that macroeconomic time series may not exhibit stationarity over time [32]. Therefore, the implementation of unit root tests might still be necessary in order to ensure that the assumption of [26] is not infringed. [27] opined that in the presence of *I(2)* variables, the computed F-statistic provided by [26] is rendered invalid and as well caused spurious regression because the bounds test are based on the assumption that the variables are *I(0)* or *I(1)* or mutually cointegrated. A unit root test result would therefore provide important information to justify the choice of the ARDL framework for cointegration analysis as the appropriate technique of estimation. The standard Augmented Dickey-Fuller (ADF) unit root test was exercised to check the order of integration of these variables. The results obtained are reported in Table 2. Based on the ADF test statistic, it was observed that out of five (5) variables, three (3) (i.e., average temperature, malaria and pneumonia) were stationary at first difference, *I(1)*, while crop production and rainfall were stationary at level, *I(0)*. Expectedly, the mixture of both *I(0)* and *I(1)* variables would not be possible under the Johansen procedure. This gives a good justification for using ARDL model.

Therefore, since all the criteria were met, this analysis seems appropriate.

Table 2. Results of Unit Root (ADF) Test

Variables	Level [I(0)]		First Differences [I(1)]	
	Constant	Constant and Trend	Constant	Constant and Trend
LCP	-5.089109 (7)***	-4.377027 (7)**	-4.989620 (3)***	-5.062626 (0)***
LTP	-1.29903341 (3)	-2.340643 (0)	11.57289 (1)***	-6.733288 (1)***
LRF	-5.639295 (0)***	-5.627956 (0)***	-7.743035 (0)***	-10.52832 (0)***
LML	-2.429182 (1)	-2.386139 (1)	-13.47781 (0)***	-13.24107 (0)***
LPN	-0.690383 (2)	-1.005221 (2)	-10.63103 (0)***	-5.492622 (1)***

Notes:

1.***, **, * imply significance at the 1%, 5%, 10% level respectively.

2.The figures in parentheses for the ADF (Dickey-Fuller, 1979) statistic represents the lag length of the dependent variable used to obtain white noise residuals.

3.The lag length for the ADF was selected using Automatic-based on SIC, max lag = 7

4.LCP = log Crop production output; LTP = log Temperature; LRF = log Rainfall; LML = log Malaria; LPN = log Pneumonia

5.The null hypothesis is that the series is non-stationary, or contains a unit root, this was rejected based on MacKinnon (1996) critical values. The lag length was selected based on SIC criteria ranged from lag zero to lag seven

Source: Computed from Field Survey Data, 2014.

Lag Order Selection Criteria Analysis

Unrestricted Vector Autoregression (VAR) by lag selection criteria was modelled to the time series data in order to determine the optimal number of lags for the model. This was necessary to ascertain how many lags to be used in the equation.

The result in Table 3 revealed that the optimal lag length was one (1) as estimated by all the criteria i.e.

Table 3. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-15.15196	NA	0.225086	1.343464	1.576997	1.418173
1	20.01578	56.26839*	0.023126*	-0.934385*	-0.654146*	-0.844734*
2	20.63446	0.948645	0.023800	-0.908964	-0.582018	-0.804371

* indicates lag order selected by the criterion; LR: sequential modified Likelihood Ratio test statistic (each test at 5%level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Akaike Information Criterion (AIC), Schwarz's Bayesian Information Criterion (SBIC) and Hannan-Quinn Information Criterion (HQIC).

The model with the lowest value of estimated standard errors was chosen for the study, and the lowest value for each estimator falls under lag one (1).

Based on the result, SBIC criterion was chosen for the determination of optimum lag length of ARDL model. ARDL (1,0,0,1,0) model was selected as a common consequence of the SBIC criterion.

Cointegration Test Based on ARDL Bounds Testing Approach

In the first step of the ARDL analysis, the presence of long-run relationships was tested in equation (6), using equation (7). Using a general-to-specific modelling approach guided by the short data span and SIC respectively to select a maximum lag order of 1 for the conditional ARDL-VECM. An OLS regression was estimated from equation (7) and

then tested for the joint significance of the parameters of the lagged level variables when added to the regression analysis. Moreover, [25] reported that an OLS regression results in equation (7) are of "no direct interest" to the bounds testing approach to cointegration test. The F-statistic tests the joint null hypothesis that the coefficients of the lagged level variables are zero (i.e. no long-run relationship exists between the variables in question). The F-statistic is estimated using Wald Test of coefficients in the ARDL-OLS regressions. Table 4 showed that the value of calculated F-statistic for F_{LCP}(LCP | LTP, LRF, LML, LPN) to be 4.38 which is higher than the upper bound critical value of 4.01 at the 5% level. Thus, the null hypothesis of no cointegration was rejected. This indicates that there is a long-run cointegration relationship among the variables when crop production is regressed against explanatory variables of average temperature, rainfall, malaria and pneumonia. The outcome of this study is similar to the findings of [4][24] who reported a long run association between climatic variables (rainfall and temperature) and crop productivity in Nigeria using Johansen test of cointegration.

Table 4. Results of Cointegration Test Based on ARDL Bounds Test Approach

	Critical Value Bounds of the F-statistic	
Critical value	**lower bound I(0)**	**Upper bound I(1)**
1%	3.74	5.06
5%	2.86	4.01
10%	2.45	3.52
Computed F – Statistic : F_{LCP}(LCP | LTP, LRF, LML, LPN) = 4.38		

Note: Critical Values are cited from Pesaran et al. (2001), Table CI (iii), Case 111: Unrestricted intercept and no trend, Number of regressors (K) = 4.

Analysis of Long Run Estimates

The long run coefficents of ARDL (1,0,0,1,0) were presented in Table 5.

The results demonstrated that rainfall and pneumonia had negative impact on crop production in the long run.

Statistically, the empirical findings demonstrated that 1% increase in amount of rainfall and pneumonia incidence led to 0.12% and 0.45% decrease in crop production respectively. This implies that incidence of rainfall pattern that leads to storm, flood, uncontrollable erosion and leaching will reduce crop yield in the study area.

In the same vein, occourrence of pneumonia that leads to the absence of farmers from farm activities and as well make him incurred cost of treatment will cause a significant decrease in crop production.

Table 5. Estimated Long Run Coefficients using the ARDL Approach

Regressor	**Coefficient**	**Standard Error**	**T-Ratio**	**Prob.**
LTP	0.86350	4.2565	0.20287	0.841
LRF	-0.12010**	0.0604	1.98901	0.047
LML	0.11959*	0.0713	1.67727	0.089
LPN	-0.45513**	0.2160	2.10781	0.015
C	9.6817	4.8466	1.99762	0.039

Note: *, **, ***, significant at 10%, 5%, 1% respectively; ARDL (1,0,0,1,0) selected based on Schwarz Bayesian Criterion; LCP = log Crop production output; LTP = log Temperature; LRF = log Rainfall; LML = log Malaria; LTF = log Pneumonia;
Source: Computed from Field Survey, 2014.

Analysis of Short Run Estimates – Vector Error Correction Model (VECM)

The short run dynamic coefficients associated with the long-run cointegration relationships were obtained from the analysis of Error Correction Model (ECM) based on ARDL

bounds test approach. The results of the short run coefficients of ARDL (1,0,0,1,0) model are presented in Table 6. The empirical findings demonstrated that there was short run relationship among the variables. Expectedly, rainfall, malaria incidence and pneumonia incidence had negative effect on crop output in the short run. The statistically significant negative coefficient of ECM(-1) verified the long run relationship among the variables. According to [32], ECM measures how quickly the endogenous variable adjusts to the changes in the independent variables before the endogenous variable converges to the equilibrium level. Negative and statistically significant ECM demonstrates that adjustment process is effective in restoring equilibrium. Negative but low ECM in absolute value points out a slow adjustment. Therefore, ECM in this study was statistically significant at 5% level and had a value of -0.142. This implies that an approximately 14% of disequilibria from the previous year's shock converge to the long-run equilibrium in the current year. Moreover, a 1% increase in rainfall, malaria and pneumonia incidence caused a 0.01%, 0.02% and 0.06% respectively decrease in crop output in the short run. Rainfall will have negative effect on crop production when it is rained heavily, causing over flooding thereby leading to erosion and leach [4] which have been the case in the previous years in the study area. In the same vein, malaria and pneumonia could reduce crop production when the farmers were incapacitated with diseases which make them to be absent from the farm activities and as well render them inefficient in actualizing their potentials. Moreover, [1] opined that diseases (such as malaria and pneumonia) affect agricultural systems by affecting the health of producers. Poor health will result in loss of work days or decrease worker capacity, decrease innovative ability and ability to explore diverse farming practices thus making farmers to capitalize on farm specific knowledge.

Table 6. Results of the ARDL Short-run Relationship

Regressor	Coefficient	Standard Error	T-Ratio	Prob
ΔLTP	0.12300	0.4489	0.2740	1.987
ΔLRF	-0.01711***	0.0061	-2.8316	0.001
ΔLML	-0.02632***	0.0109	-2.4113	0.003
ΔLTF	-0.06483*	0.03354	-1.9331	0.059
C	1.3791	2.0787	0.6634	0.513
ecm(-1)	-0.14244**	0.0683	-2.0855	0.012

ecm = LCP -.86350*LTP + .12010*LRF -.11959*LML + .45513*LTF -9.6817*INPUT.

****

R-Squared	.38461	R-Bar-Squared	.19732
S.E. of Regression	.11880	F-stat. F(6, 24)	2.3958[.059]
Mean of Dependent Variable	.042675	S.D. of Dependent Variable	.13261
Residual Sum of Squares	.32463	Equation Log-likelihood	26.6781
Akaike Info. Criterion	18.6781	Schwarz Bayesian Criterion	12.9421
DW-statistic	1.4129		

****

R-Squared and R-Bar-Squared measures refer to the dependent variable dLNCP and in cases where the error correction model is highly restricted, these measures could become negative.

LCP = log Crop production output; LTP = log Temperature; LRF = log Rainfall; LML = log Malaria; LTF = log Typhoid fever

Source: Computed from Field Survey, 2014.

The outcome of this study is similar to that of [4] who reported a negative and significant effect of rainfall on agricultural productivity but contrary in the case of temperature using Johansen test of cointegration approach.

Again, [23] reported a bi-directional relationship between crop productivity and

rainfall in Nigeria using granger causality test spanning from 1970 to 2008.

Analysis of ARDL Diagnostic Tests

At 5% significant level, the F-test accepts the null hypotheses of no serial correlation, homoscedasticity, normal distribution and functional form misspecification as depicted in Table 7. Furthermore, stability tests using the cummulative sum of recursive residuals (CUSUM) and cummulative sum of squares of recursive residuals (CUSUMq) plots of [5] for the ARDL model as shown in Figure 2 depicted the movement of the CUSUM or CUSUMq outside the critical lines of 5% significant level indicates parameter instability. From the Figure, CUSUM statistic lies within the 5% critical lines, meaning that the model cofficients are stable in the short run. On the other hand, CUSUMq statistic for the model coefficients cross the critical value line, indicating some instability in the ARDL model in the long run.

Table 7. Results of Diagnostic Tests

Test	χ^2 statistic	Probability
Breusch-Godfrey Serial Correlation test	2.5686	0.123
White Heteroskedasticity test	3.7987	0.161
Jarque-Bera test (Normality)	1.0658	0.583
Ramsey RESET Test (log likelihood ratio) – Functional Form	9.0061	0.711

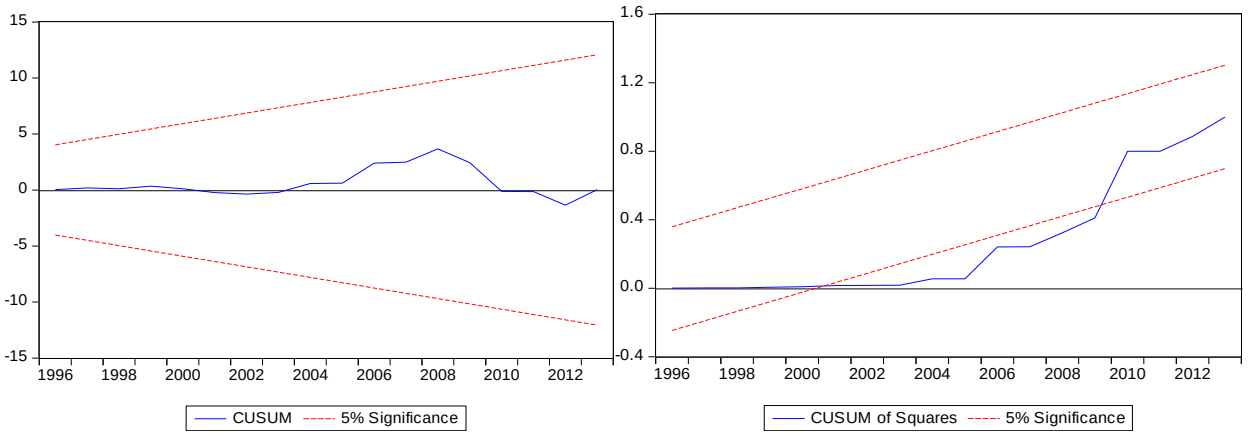

Fig. 2. Plot of the Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Recursive Residuals of Square (CUSUMq) Tests for ARDL Model
Source: Computed from Field Survey, 2014.

CONCLUSIONS

The study specifically looked into the relationship between crop production and selected climate and health variables (temperature, rainfall, malaria and pneumonia) in Ondo State, Nigeria. Secondary data were used for this study which were sourced from NBS, Ministry of Health and ADP spanning the period of 1982 to 2013. The analytical tools used were descriptive statistics (mean, standard deviation, frequency distribution and percentage) and auto-regressive distributed lag (ARDL) model (bounds testing approach to cointegration). The results of cointegration test using autoregressive distributed lag (ARDL) model revealed that crop production and rainfall data were stationary at level, while average temperature, incidence of malaria and pneumonia data were stationary at first difference using ADF test. ARDL results confirmed the presence of long run relationship between crop production and temperature, rainfall, malaria and pneumonia (F-value to be 4.38, $p < 0.05$). The results of long run estimates showed that rainfall and pneumonia were significant in affecting crop production negatively. On the other hand, the results of the short run estimates showed that all the variables except temperature were significant

and negatively affected crop production in the short run. The long run relationship among the variables were further confirmed and verified by ECM (-1). About 14% of disequalibria from the previous year's shock converge to the long run equalibrium in the current year given an ECM value of -0.142.

Based on the findings of this study, it can be concluded that crop production was affected negatively by climate variability (such as changes in rainfall leading to drought, flooding, storm and heavy rainfall) and climate-sensitive diseases (e.g malaria and pneumonia leading to health poor vis-a-vis unproductive and inefficient farmers) both in the long and short runs in the study area.

The following policy recommendations were proffered based on the findings of this study:

(i)Government should provide safe drinking water, improved sanitation and adequate medical care that will prevent and control malaria and pneumonia incidences in the study area. This could be achieved by providing bole-hole or pipe borne water, modern healthcare centres and standard drainage to control erosion and flood that lead to extreme.

(ii)Early warning/meteorological forecasts and related information cum health surveillance programmes should be established especially among the most vulnerable groups. This can be channelled through radio and mobile phone.

(iii)Government should design holistic programme that will put the farmers at the frontline in order to reduce catastrophic health cases in the area most especially malaria and pneumonia.

This could be done through disease prevention and environmental sanitation under the framework of the primary health care programme.

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IMPACT OF SUSTAINABLE SOIL MANAGEMENT TECHNIQUES ON NET INCOME OF ARABLE CROP FARMERS IN IMO STATE, NIGERIA

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Abstract

Effective land management techniques are sine qua-non for increased outputs and income of the farmers. Hence, this study evaluated the impact of sustainable soil management techniques on net income of arable crop farmers in Imo State, Nigeria. Multi-stage random sampling technique was used to select 209 arable crop farmers. Objectives of this study were elicited from the sampled respondents through a well structured questionnaire. Data were analyzed using descriptive statistical tools, average treatment effect (ATE) and local average treatment effect (LATE) models. The socio-economic features of the farmers reveals a mean age of 53 years, 6 persons per household, 6 years educational attainment, 17 years farming experience and 1.0 hectare of land. The LATE estimates by WALD and (IV) were given as ₦50, 186.91/ha and ₦61,456.02/ha. These estimates showed that the use of sustainable soil management techniques had a positive relationship with the farmers' net income and was highly significant at 1 percent statistical level. Hence, there is the need for corporate bodies through the extension agents and other agricultural officers to educate the rural farmers on the importance of using improved farming techniques for increased net income.

Key words**:** *impact, sustainable soil management, techniques, net income, crop farmers*

INTRODUCTION

The challenge for agriculture to meet the World's increasing demand for food in a sustainable way is still far-fetched. This could be credited to the declining soil management techniques among the household farmers. The World population
growth and its associated land fragmentation are forcing farmers to cultivate on small plots that are hardly suitable for soil improvement practices [4]. As long as agriculture remains a soil-based industry, major increases in productivity is likely to be attained through sustainable soil management techniques (SSMT) which ensure that plants have adequate supply of balanced of nutrients. According to the estimates of [2], only 12% of African soils is moderately fertile or well drained, compared to 33% in Asia, while about 88% is infertile covering an area of about 494 million hectares in the continent. Although soils in most developing African countries have inherently low fertility as a result of poor and inadequate soil management practices. In West-Africa and its suburbs, soil management technique such as alley cropping where farmers grow crops between rows of trees has been found to increase income and crop productivity. This practice is sustainable as it enables the same plot to be cultivated over and over, thus eliminating the need for the continual burning of the rain-forest to get fertile plots. Soil management techniques used in improving soil quality is becoming relevant in West-Africa, since it determines the level of food production, and to a great extent, the state of the global environment. Hence, soil management techniques are increasingly taking a central stage in agricultural policies and rural development among developing countries like Nigeria. It is an approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and enhancing the resource base and the environment [14].
Sustainable soil management techniques provide farmers with a means for optimizing their yields and profits while maintaining a balance between agricultural, economic and

environmental benefits on a sustainable basis [15]. As a result, these reduce poverty amongst the arable crop farmers in Nigeria. Moreover, some soil management/ conservation practices have been proven to be sustainable among farmers in Nigeria and they include: conservation tillage practices, soil fertility improvement practices, and erosion control practices. Though, arable crop farmers still use soil management practices that are unsuitable with its attendant low income and productivity. [12] stated that soil management techniques practiced in most parts of Imo State is concomitant to soil erosion, soil nutrient depletion and decline income. Thus, the extent to which the use of sustainable soil management techniques (SSMT) by arable crop farmers to increase their income and reduce poverty especially in Imo State has not been documented, hence the
need for this study.

MATERIALS AND METHODS

This research work was carried out in Imo State, Nigeria located in the South Eastern part of Nigeria. The State has a land region of 5,530 sq km and lies between latitudes $4^0 45^I$N and $7^0 15^I$N and Longitudes $6^0 50^I$E and $7^0 25^I$E. The State bound in the East by Abia and Cross Rivers, to West by Delta State, South by Rivers State, and North by Enugu and Anambra. The State has 27 Local Government Areas sorted into three agricultural zones; Owerri, Orlu and Okigwe. The occupants in the area are mostly associated with Farming. Multi-stage sampling technique was applied in this study. First stage has two local government areas (LGAs) purposively selected from each of the three agricultural zones. Selections were done based on use of sustainable soil management techniques (SSMT). Ngor-Okpala and Ohaji-Egbema was taken from Owerri zone, Nwangele and Isu from Orlu zone while Okigwe has Isi-ala Mbano and Obowo making six (6) local government areas used for the study. In the second stage, farmers were randomly selected from the list of filed crop farmers using SSMT, in custody of the zonal ADP's in each of the selected LGAs. Owerri zone has 122 filed arable crop farmers while Orlu and Okigwe zones have 130 and 109 arable crop farmers. This depicts that there are inadequate numbers of crop farmers across the zones. Adequate sample was attained from a ratio of 70 percent of the total population from each zone. This gave Owerri zone a sample size of 85, 91 for Orlu zone and 76 for Okigwe zone making a total of 252 crop farmers across the six LGAs. The study used only 209 valid questionnaires for data analysis.

Data were analyzed using descriptive statistical tools, average treatment effect (ATE) and local average treatment effect (LATE) models following [5].

Average Treatment Effect models were specified thus:

$$\mathbf{ATE} = \frac{1}{n}\sum_{i=1}^{n} - \frac{(d_i - p(X_i)y_i}{p\,(X_i)(1-p(X_i)} \quad -- \qquad (1)$$

$$\mathbf{ATE1} = \frac{1}{n1}\sum_{i=1}^{n} - \frac{(d_i - p(X_i)y_i}{(1-p)(X_i)} \quad ---- \qquad (2)$$

$$\mathbf{ATE0} = \frac{1}{1-n1}\sum_{i=1}^{n} - \frac{(d_i - p(X_i)y_i}{p(X_i)} \quad --- \qquad (3)$$

where n is the sample size, $n_i = \sum_{i=1}^{n} d_i$ is the number of treated (ie. number of SSMT users)

$P(X_i)$ represents the PSM evaluated at X_i

ATE = Average treatment effect

ATE0 = Average treatment effect on the untreated

ATE1 = Average treatment effect on the treated

Yi = Outcome variable,

di = Use status of the farmers.

The LATE Model is further expressed as follows:

$$\mathrm{E}(y_1 - \frac{y_0}{d_1} = 1) = LATE = \frac{cov(y,z)}{cov\,(d,z)} \quad \text{.....(4)}$$

$$= \frac{E\left(\frac{y}{z}=1\right) - E(\frac{y}{z}=0)}{E\left(\frac{d}{z}=1\right) - E(\frac{d}{z}=0)} \quad \text{.....} \quad (5)$$

$$= \frac{E(y_i * (z - E(z_i)}{E(d_i * (z - E(z_i)} \quad \text{.....} \quad (6)$$

The right hand side of eqn. (6) can be estimated by its sample analogue:

$$\left(\frac{\sum_{i=1}^{n} y_i z_i}{\sum_{i=1}^{n} z_i} - \frac{\sum_{i=1}^{n} y_i(1-z_i)}{\sum_{i=1}^{n}(1-z_i)}\right) \text{ X } \left(\frac{\sum_{i=1}^{n} d_i z_i}{\sum_{i=1}^{n} z_i} - \frac{\sum_{i=1}^{n} d_i(1-z_i)}{\sum_{i=1}^{n}(1-z_i)}\right)$$

.....(7)

where:
Z = binary outcome variable
y_1 = high users of SSMT
y_0 = low users of SSMT
d_i = Use status of the farmers
E = mathematical function.
These formulas represent the Wald and IV estimators, which is done using two-stage least squares. The model was designed by [9] and [8] in treating a set of heterogeneous sample that has two possible outcomes denoted by y_1 and y_0.

RESULTS AND DISCUSSIONS

Socio-Economic Characteristics of the Respondents

The mean age of the farmers was 53 years as shown in Table 1. This agrees with the findings of [1] who reported mean ages of 52 and 53. This implies that 25.8% of the farmers are over 60 years and thus, were ageing. This might have a tremendous influence on productivity and efficiency of resource utilization, since the strength of older farmers weakens by age. The mean household size was 6 persons. This implies that the household size in the area was relatively large and therefore could enhance production efficiency of the crop farmers since rural households rely more on members of their households than hired labourers who charge outrageous wages. This is in line with [13] who reported mean household sizes of 6 to 7 persons and therefore stated that large household size is a significant source of human power utilized in the farm operations. The mean years of formal education of the farm households were 6 years showing that majority of the farmers' had primary education which depicts a low educational background. Though these farmers can relatively read and write but may find it difficult to take critical decision. concerning their farming enterprises [3]. The mean farming experience of the farmers was 17 years. This means that most of the farmers were experienced in the farming enterprise which might considerably reduce inefficiency in production. This is consistent with [10] who reported that years of farming experience of a farmer increases his production efficiency and helps him overcome certain inherent farm production constraints. The mean extension contacts were 14 times, per cropping season. This implies that, on the average most of the household farmers were exposed to technical innovations from the extension agents, thus the utilization of these innovations tends to increase the land productivity and net income of the crop farmers. This is in line with [3] who reported that as change agents, extension workers serve as channels for diffusion of technical knowledge and innovations. However, the mean farm size was 1.0 hectares. This implies that majority of the farmers in the area operated on small-scale bases (cultivating less than 2.0 hectares). This supports the findings of [13] who reported that rural farm lands are characterized by small-sized holdings, fragmented and scattered which poses a great threat to land productivity and mechanization.

Table 1. Socio-economic characteristics of the respondents

Variable	Mean
Age (years)	53
Household size (No of persons)	6
Education (years)	6
Farming experience (years)	17
Extension contacts	14
Farm size	1.0

Source: Field Survey, 2015

Source of Funds of the Arable Crop Farmers in Imo State

The distribution of farmers based on their sources of funds for their farm work is shown in Table 2. According to this Table, the major sources of funds for farm households were from co-operative societies and local money lenders which accounted for 89.0 percent and 81.8 percent respectively. This implies that farm households in the study area relied more on co-operative societies and local money lenders for funds. This corroborates the findings of [11] who stated that rural farmers tends to source funds from co-operative societies and local money lenders due to the little or no interest charges placed on such funds. Personal savings was as low as 7.7 percent; this further implies the inability of the farm households to save money probably due to the need to meet day to day family

responsibilities. This further supports the findings from [16] who reported that over 60 percent of the rural farm households are generally resource poor and hence made use of borrowed capital to finance their farming businesses. However, only 6 percent of the farmers obtained their funds from banks. This may be as a result of the stringent conditions associated with bank lending. Also, most farmers lack suitable collateral to qualify them for bank lending. This is in line with [13].

Table 2. Distribution of farmers based on source of funds

Source of Funds	*Frequency	Percentage
Friends and Relatives	54	25.8
Local Money Lenders	171	81.8
Age Grade	49	23.4
Co-operative Societies	189	89.0
Banks	12	5.7
Personal savings	16	7.7

Source: Field survey data, 2015
*Multiple responses

Impact of Sustainable Soil Management Techniques on Net Income of Arable Crop Farmers in Imo State

The impact of sustainable soil management techniques on net income of arable crop farmers is shown in Table 3.

The result shows the estimates of propensity score matching (PSM) and inverse propensity score weighing (IPSW). The PSM shows an estimate of ₦49, 974.76/ha while IPSW has a lesser value of ₦40, 171.08/ha. These values are quite different from the values obtained by [7]. These estimates actually showed the average treatment effect (ATE) on the use of sustainable soil management techniques (SSMT) on the farmer's net income. It controls the observable covariate that is partly responsible for farmers self selection into the use of sustainable soil management techniques but cannot explain the total impact of the use of SSMT on farmers' net income. Since the PSM and IPSW are all positive and significantly different from zero at $P < 0.05$ critical level, the impact of SSMT on net income is partly accounted for by the PSM and IPSW as its net income can be increased by ₦49,974.76/ha and ₦40,171.08/ha respectively. [9] noted that the use of PSM only removes overt bias in self selection problem. However, the use of these estimates is relevant but not sufficient hence, it is an inconclusive estimation procedure as it does not account for the unobservable covariates in impact studies. Furthermore, as indicated earlier, the ATE estimates on the impact of sustainable soil management techniques on our outcome of interest do not have a causal interpretation due to the problem of non-compliance and endogenous treatment. Consequently, the use of local average treatment effect (LATE), either estimate by WALD or Instrumental Variable (IV) offers a conclusive result as it takes into consideration all the unobservable covariates that affect self-selection problems in an experiment. The LATE estimates by WALD and (IV) were givenas ₦50,186.91/ha and ₦61,456.02/ha respectively. These estimates showed that the use of sustainable soil management techniques had a positive relationship with the farmers' net income and was highly significant at 1 percent statistical level. This implies that the use of sustainable soil management techniques by the arable crop farmers increased farmers net income by ₦50,186.91 and ₦61,456.02 respectively. This further showed that the use of sustainable soil management techniques in the area had a significant impact on the net income of the crop farmers. Thus, a unit increases in the use levels of sustainable soil management techniques would lead to a unit increase in the net income of the farmers. This finding is consistent with *a priori* expectations and also supports the findings of [6] and [9]. The disparity between the LATE results was further explained by the use of Instrumental Variable. Moreover, since the use of SSMT is endogenous, farmers were faced with non-compliance which requires the use of an Instrumental Variable which is extension contacts. Extension contacts offers demonstration on the use of SSMT, farmer's diffusion, adoption and continual use of SSMT. Hence, the use of the Instrumental Variable helped in removing the hidden bias into self selection of a technique and this explains why the farmer's income further increased to ₦61,456.02/ha. This estimated

value of ₦61,456.02/ha is better than the LATE estimated using WALD. This is because the WALD estimate does not fully account for the impact of SSMT on net income of the arable crop farmers like the instrumental variable (extension contacts) that has completely removed the hidden bias into farmers self selection problem. Therefore, it is suggested that extension contacts should be built into any program that seeks to advance farmer's use of any technology in crop production.

Table 3. Impact of Sustainable Soil Management Techniques on Net Income of Arable Crop Farmers in Imo State
LATE Estimators

PARAMETER	LATE (WALD)	LATE (IV)	ATE (IPSW)	PSM
ATE	50186.91	61456.02	40171.08	49974.76
	(40.12)***	(76.90)***	(2.46)**	
ATE 1			38841.94	
			(2.39)**	
ATE 0			35640.21	
			(1.07)	

Source: Computed from field survey data, 2015
***; ** indicates statistical significance at 1 percent, and 5 percent respectively

CONCLUSIONS

Sustainable land use patterns have proven to be primal towards increased output with its attendant benefits. Hence, this research work depicts that increased use levels of sustainable soil management techniques increased the net income of the arable crop farmers.

Findings from this study also established that extension contacts were perceived by the arable crop farmers to be instrumental towards increasing their net income. The mean extension contacts were 14 times, per cropping season.

This implies that, on the average most of the household farmers were exposed to technical innovations from the extension agents, thus the utilization of these innovations tends to increase the land productivity and net income of the crop farmers. T

his finding is further validated by other empirical results and therefore calls for strategic policy making. Hence, there is the need for corporate bodies through the extension agents and other agricultural officers to educate the rural farmers on the importance of using improved farming techniques for increased net income.

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IMPACT OF SUSTAINABLE SOIL MANAGEMENT TECHNIQUES ON LAND PRODUCTIVITY OF ARABLE CROP FARMERS IN IMO STATE, NIGERIA

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Abstract

The study was designed to examine the impact of sustainable soil management techniques on land productivity of arable crop farmers in Imo State, Nigeria. Despite various efforts to produce basic foods for the increasing population in Nigeria, the track record of performance over the years has proved abortive. This stems from the use of variant unsustainable soil management techniques which are concomitant to soil erosion, nutrient depletion and decline in food production. Multi-stage random sampling technique was used to select 209 arable crop farmers. Objectives of this study were elicited from the sampled respondents through a well structured questionnaire. Data were analyzed using descriptive statistical tools, average treatment effect (ATE) and local average treatment effect (LATE) models. Results showed that farmers in the area have varied knowledge of sustainable soil management techniques (SSMT). The PSM and IPSW estimates were ₦141.14 and ₦97.06 respectively while the LATE by WALD and IV were ₦152.26 and ₦158.17. This implies that the use of SSMT has an impact on the productivity of land per unit increase in rent. Hence, farmers at all level should be encouraged to practice efficient soil management techniques in order to improve the productivity of the land.

Key words**:** *impact, Sustainable soil management technique, land productivity, Late Model, arable crop farmers*

INTRODUCTION

Agriculture remains a significant sector in the Nigerian economy despite the strategic importance of the crude oil sector. Apart from kick-starting economic growth, it has the ability to reduce poverty and hunger [12]. The sector provides employment for a large labour force and accounts for more than one-third of total Gross Domestic Product (GDP) in Nigeria [18]. The contribution of agriculture to GDP has been on decline since early 70's. Empirical studies showed that it dropped from 90% in 1960 to 56% in 1969 and has continued to be less than 40% since 1986 due to over dependence on oil and other environmental and socio-economic factors [1]. Land degradation has also contributed immensely to the declining state of agricultural productivity, food insecurity, malnutrition and further increased poverty among the farming households in Nigeria. Again, in spite of the soil management techniques and land use policies in Nigeria, agricultural productivity has continued to decline leading to a fall in agricultural growth, low performance of agricultural share on GDP and export earnings [17]. Majority of arable crop farmers in Nigeria are characterized with unsustainable farming practices which deplete soil fertility leading to low crop yields, low income and high poverty incidence of crop farmers. These farmers are often hindered by the small farm size holdings, which do not encourage soil improvement practices and farm mechanization [16]. The use of sustainable soil management techniques provide farmers with a means for optimizing their yields and profits while maintaining a balance between agricultural, economic and environmental benefits on a sustainable basis. As a result, these reduce poverty and aid land productivity. Moreover, some soil management/ conservation practices have proven to be sustainable among farmers in Nigeria and they include: conservation tillage practices, soil fertility improvement practices, and erosion control measures, etc. However, in some parts of Nigeria, for instance, in South-

West, the outputs of farmers are plagued with unsustainable soil management techniques coupled with prolonged interface between human induced and natural factors. Soil degradation in the area worsens as farmers cannot use modern technologies amidst inappropriate soil management practices such as continuous cropping, bush burning, deforestation, indiscriminate vegetation removal, over grazing and use of marginal lands for agricultural purposes which often precede eventual degradation of soil resources and environmental damages. These soil practices however cannot sustain the soil nor vegetative cover over a long period of time. Again in North-East Nigeria, sustainable soil management activities follow a flexible ecological pattern [14]. This is due to the prolong dry season and climatic condition in the area. This outcome forces farmers to adopt unsustainable soil management techniques which put significant pressures on soil health. Increased stock grazing on farmlands in the area increases the potential for soil compaction, pugging and erosion. Similarly, these incidences are the same in Imo State as crop farmers in the State use soil management techniques that do not conserve the soil, but rather exacerbate it. The need to overcome these challenges in the State have raised a concern when evaluation of a package like sustainable soil management technique (SSMT) is the issue.

MATERIALS AND METHODS

Research was done in Imo State of Nigeria, sited in the South-East of Nigeria with a land expanse of 5,530 sqkm. The State is situated between latitudes $4^0 45^I$N and $7^0 15^I$N and Longitudes $6^0 50^I$E and $7^0 25^I$E. It has boundaries in the East, West, South, and North with Abia and Cross Rivers State, Delta, Rivers, and Enugu and Anambra State. It is made up of 27 Local Government Areas classified into 3 agricultural zones; such as Owerri, Orlu and Okigwe. Farmers in these areas practice agriculture. Multi-stage sampling technique was employed for this study. A purposive selection of 2 local government areas (LGAs) was done in the first stage from each of the 3agricultural zones of the State. LGAs selected were based on their agricultural prowess and use of improved soil management techniques. The selected LGAs were Ohaji-Egbema and Ngor-Okpala, Isu and Nwangele, Obowo and Isi-ala Mbano respectively totaling 6 local government areas used for this study. Stage two, involved a random sample selection of farmers from the list of documented crop farmers using SSMT, with the zonal ADP's in each of the selected LGAs sampled. 122 farmers were recorded for Owerri zone while Orlu and Okigwe zones accounts for 130 and 109 crop farmers. This implies uneven distribution of the farmers in the area. Therefore, a rational representation of sample was taken from a proportion of 70% of the total population from each zone. Owerri zone had 85 sample size, Orlu 91 and Okigwe 76. This gave a total of 252 arable crop farmers but only 209 valid questionnaires were used for analysis. Descriptive statistical tools, average treatment effect (ATE) and local average treatment effect (LATE) models were used for data analyzes following [8].

Average Treatment Effect models were specified thus:

$$\textbf{ATE}=\frac{1}{n}\sum_{i=1}^{n}-\frac{(d_i-p(X_i)y_i}{p\,(X_i)(1-p(X_i)} \qquad \text{eqn.1}$$

$$\textbf{ATE1}=\frac{1}{n1}\sum_{i=1}^{n}-\frac{(d_i-p(X_i)y_i}{(1-p)(X_i)} \qquad \text{eqn.2}$$

$$\textbf{ATE0}=\frac{1}{1-n1}\sum_{i=1}^{n}-\frac{(d_i-p(X_i)y_i}{p(X_i)} \qquad \text{eqn.3}$$

where n is the sample size, $n_i = \sum_{i=1}^{n} d_i$ is the number of treated (i.e. number of SSMT users)
$P(X_i)$ represents the PSM evaluated at X_i
ATE = Average treatment effect
ATE0 = Average treatment effect on the untreated
ATE1 = Average treatment effect on the treated
Yi = Outcome variable,
di = Use status of the farmers.
The LATE Model is further expressed as follows;

$$\mathrm{E}(y_1-\frac{y_0}{d_1}=1)=LATE=\frac{cov(y,z)}{cov\,(d,z)} \qquad \text{eqn.4}$$

$$= \frac{E\left(\frac{y}{z}=1\right) - E(\frac{y}{z}=0)}{E\left(\frac{d}{z}=1\right) - E(\frac{d}{z}=0)} \quad \text{eqn.5}$$

$$= \frac{E(y_i*(z-E(z_i)}{E(d_i*(z-E(z_i)} \quad \text{eqn.6}$$

The right hand side of eqn. (6) can be estimated by its sample analogue:

$$\left(\frac{\sum_{i=1}^{n} y_i z_i}{\sum_{i=1}^{n} z_i} - \frac{\sum_{i=1}^{n} y_i(1-z_i)}{\sum_{i=1}^{n}(1-z_i)}\right) X \left(\frac{\sum_{i=1}^{n} d_i z_i}{\sum_{i=1}^{n} z_i} - \frac{\sum_{i=1}^{n} d_i(1-z_i)}{\sum_{i=1}^{n}(1-z_i)}\right) \quad \text{eqn.7}$$

where:
Z = binary outcome variable
y_1 = high users of SSMT
y_0 = low users of SSMT
d_i = use status of the farmers
E = mathematical function
These models are known as the Wald and IV calculated using two-stage least squares. The concept was designed by [10] and [9] in treating a set of dual population that has two possible outcomes.

RESULTS AND DISCUSSIONS

Types of Sustainable Soil Management Techniques among Farmers in Imo State

The various types of sustainable soil management techniques among farmers are shown in Table 1. It could be deduced from the Table that farmers in the area have varied knowledge of sustainable soil management techniques which ranges from contour cropping to shifting cultivation. The Table showed that all the arable crop farmers in the area have adequate knowledge of organic manure and multiple cropping. Organic manure is largely practiced by arable crop farmers to improve the fertility of the soil and productivity of the land. This could be due to its local accessibility and cheap source of the manure. This is in line with [14] who stated that organic manure is widely used by arable crop farmers to improve soil fertility and increase the productivity of the land. On the other hand, multiple cropping is mainly practiced to avert the risks of total crop failure. Multiple cropping is further practiced by arable crop farmers due to the ability of the farmland to accommodate one type of crop or the other per cropping season. This enhances better distribution of labour through-out the farming season, maintenance of organic matter, covering of the soil through-out the year, thus controlling run off cum erosion and producing different types of crops per cropping season [5] and [7]. Similarly about 99.0, 98.0 and 96.2 percent of the arable crop farmers are aware of shifting cultivation, bush fallowing and crop rotation. Shifting cultivation and bush fallowing are soil management techniques used to improve the fertility of the soil and enhance crop productivity of the farmers. However these soil management techniques are rarely practiced by crop farmers due to land scarcity and tenure systems available to the arable crop farmers. This conforms to the findings of [4]. On the other hand, good management of the soil through crop rotation ensures adequate nutrient availability through-out the cropping season and maintain balanced soil ecosystem [13]. Consequently, a cross section of the arable crop farmers are aware of mulching 95.2 percent, planting of leguminous/cover crops, 94.0 percent, erosion control measures using vetiver grass, 93.0 percent and minimum/zero tillage, 89.0 percent respectively. These soil management techniques are generally used to control soil erosion and reduce water run-off in most farmlands. This is consistent with the findings of [11]. Again, another section of the arable crop farmers in the area are aware of alley cropping 69.0 percent, crop residue recycling 68.0 percent and mixed farming, 49.0 percent respectively. These soil management techniques helps in increasing the farm productivity of the farmers, thus leading to an increase in income of the arable crop farmers. According to [4], these soil management techniques improve farm productivity of the farmers which in turn increases their farm income. Also [5] further stated that these soil management techniques increases soil fertility which enhances the productivity of the farmers. Furthermore, arable crop farmers in the area are aware of liming 42.1 percent, taungya farming 36.4 percent, contour cropping 32.1 percent and strip cropping 29.2 percent respectively. Liming is practiced by most arable crop farmers to reduce the acidity of the soil. Taungya farming improves soil fertility which enhances crop yields and

productivity of the farmers [6]. Contour and strip cropping on the other hand are used by crop farmers on slope farmlands to reduce the risks of water run-off and soil loss. Consequently contour and strip cropping techniques are sometimes difficult to practice due to its technical applications. This conforms to the findings of [4].

Table 1. Distribution of Farmers on Types of Sustainable Soil Management Techniques in Imo State

Types of SSMT	*Frequency	Percentage
Contour Cropping	67	32.1
Strip Cropping	61	29.2
Crop Rotation	201	96.2
Planting of leguminous/Cover crops	196	94.0
Crop Residue Recycling	142	68.0
Use of Organic Manure	209	100
Use of Mulching	199	95.2
Alley Cropping	144	69.0
Erosion Control Measures (Vetiver Grass)	194	93.0
Multiple Cropping	209	100
Minimum/Zero Tillage	186	89.0
Mixed Farming	102	49.0
Liming	88	42.1
Taungya Farming	76	36.4
Bush Fallowing	204	98.0
Shifting Cultivation	206	99.0

Source**:** Field survey data, 2015
*Multiple Responses

Impact of Sustainable Soil Management Techniques on Land Productivity of Arable Crop farmers in Imo State

The impact of sustainable soil management techniques on the land productivity of arable crop farmers is shown in Table 2. Land productivity here was shown as the proportion in naira of output returns per naira paid on rent. The PSM and IPSW estimates are ₦141.14 and ₦97.06 respectively. These estimates cannot identify the total casual effect of the use of SSMT on productivity as it does not accommodate the hidden bias [10]. Hence, they are declared inconclusive. However, they are positive but PSM is not significant even at P≤0.10 critical level while IPSW is evidently significant at that critical level. This implies that non-compliance still exists or at least accounted for in estimating the casual effect of the use of SSMT on land productivity. This non-compliance here means that there are farmers who will never use these technologies even when it is free for them to use or whereby a farmer had challenges in the use of a particular technique. The non-compliance effects strongly explain the hidden bias into self selection problem and can only be identified by an impact parameter called local average treatment effect (LATE).

The result shows that LATE from WALD and IV were estimated in this study and were highly significant at 1 percent statistical level. LATE estimated either way identifies the causal effect of use of SSMT in the presence of non-compliance. The LATE by WALD was ₦152.26 while that of IV was ₦158.17. Hence, this implies that the use of SSMT has an impact on the productivity of land by ₦152.26 percent per unit increase in rent. This further implies that the higher the use of the sustainable soil management techniques, the higher the land productivity of the arable crop farmers; that is, a unit increase in the use levels of the sustainable soil management techniques would lead to a unit increase in the land productivity of the arable crop farmers. This shows that with the removal of hidden bias of the crop farmers, the impact on productivity of land was increased by ₦152.26 per ₦1.00 increase in rent of land. It could be deduced from the result

that as the rent increases, the land productivity of the farmers also rises. In the same way, the LATE estimated using IV suggested an improved and consistent estimate of ₦158.17 with a unit increase in rent by ₦1.00. This implies that the IV (extension contacts) will lead to a further increase in productivity of land because it identifies the casual effects of use of SSMT in the presence of non-compliance as well as take care of hidden bias. This could be because of endogenous effects of use of SSMT shown to the farmers through extension contacts. Extension contact is persuasive to improve the performance of farmers who experience challenges in the application of a technique or who would have failed to comply even when they have identified with a particular technology. In this study, the IV improved the performance of the farmers as they were identified and included in the casual effect of the use of SSMT on the land productivity. This finding is consistent with *a priori* expectations and corroborates the findings from; [2] and [15]. The finding of impact parameter that identifies the casual effects of the use of SSMT on land productivity suggested that the identification made using IV (extension contacts) has the best performance in all the result. It is important to know that other IV like awareness level was unrealistic. Extension contacts were used because it gave realistic estimates consistent with *a priori* expectations and the findings from [3]. The finding suggests that the use of SSMT in arable crops production should be enforced with a stronger and monitored extension contacts at least to have a better impact on farmers' returns, poverty level and productivity. The use of only awareness or adoption as an instrumental variable (IV) may be misleading as the finding may be unrealistic in most cases [15]. Farmers perform better when they are convinced that a technology will improve their status quo and extension contacts has suggested that in the result; policy formulation on the use of environmental sustainable farming techniques should factor in extension contacts otherwise, farmers performance level will not be improved.

Table 2. Impact of Sustainable Soil Management Techniques on Land Productivity of Arable Crop Farmers

	LATE Estimators			
PARAMETER	**LATE (WALD)**	**LATE (IV)**	**ATE (IPSW)**	**PSM**
ATE	152.26	158.17	97.06	141.14
	(54.09)***	(66.14)***	(21.02)***	
ATE 1			90.16	
			(2.41)**	
ATE 0			71.51	
			(1.47)	

Source: **Source:** Field survey data, 2015 Computed from field survey data, 2015
***; ** indicates statistical significance at 1 percent, and 5 percent respectively

CONCLUSIONS

Despite variant use of unsustainable soil management techniques by the crop farmers, the impact of effective soil management systems cannot be undermined. The use of sustainable soil management techniques has become instrumental in improving land productivity and income of the farmers. Hence, findings from the result showed that increased use levels of sustainable soil management techniques increased the land productivity of the farmers in the area. The result also showed that all the arable crop farmers in the area have adequate knowledge of organic manure and multiple cropping which is very vital in improving the land productivity of the farmers with its attendant increase in income. However with these findings, it is expected that policy makers in Nigeria will find this study a good reference material in formulating food policies and adjusting existing ones to ensure self sufficiency in food crop production.

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CLUSTERING: CREATING AND PROMOTING BUSSINESS SOCIAL NETWORK SUPPORTED AGRICULTURE IN THESSALONIKI

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Abstract

The purpose of this paper is to investigate the creation, promotion and sustainability of a socially supported agricultural network. The recording and the theoretical co-operative strategy that can be developed by actors in the region to achieve the maximum possible growth outcomes. The methodological approach followed is based on the research of scientific approaches and scientific bibliography and aims at the overall assessment of the usefulness of such a network. As a result of this research, it is considered that proper planning and optimal use of all the data held in their hands by all the stakeholders in the network is necessary so that we have sustainability of the agro - food sector of the city and why not of the country.

Key words**:** *socially supported agriculture, clustering, agricultural sector, producer, development*

INTRODUCTION

At a time when the conditions prevailing in the global economy are uncertain and liquid, in Greece where these two factors meet in a more intense form, seek practical rather than theoretical policies, so that their implementation opening the path not only in the economy but also in every sector of the country.

Odysseus Elytis once said that "if you disintegrate Greece, what will be left to you are an olive tree, a vineyard, and a boat, with so many, you rebuild it".

Since ancient times, Greece has relied on three branches. In rural, tourism and shipping, and even as many as civilizations have been applied, these three branches, ornaments of the nation, are now dying and in a dire situation.

But there is hope, because the policies that are both at the state level, but also the initiatives taken as well as the private ones, have three main disadvantages.

First, with the rising pace of technology advancing, researchers now have valuable achievements - "companions", which make the journey of knowledge easier.

Secondly, today is the experience of yesterday and so you can study any mistakes which must be avoided.

Thirdly, there is vision and experimentation.

In the past, efforts have always been made to develop each branch separately with external intervention, and nowadays it is possible for each industry to interact with the others and to have internal self-development.

In order for this to happen macroeconomic, a micro-economic interaction of players in each sector must precede.

And the best way to achieve this is to put some boundaries, first of all geographically.

Thus, in a region, various actors (private sector (e.g. companies) and the state sector (e.g. Educational Institutions), interdependent for exchange of products and services, governed by four key factors, [6] proximity, interconnections their interactions, the number of operators and the size of each operator separately, can form a network with a common goal, through which both individual development and collectiveness will be created, as well as the Adam Smith argued in "The Wealth of Nations", the pursuit of self-interest in trade, promote the general interest [5].

MATERIALS AND METHODS

The material used for this research is the sources of knowledge of the location of the city of Thessaloniki as well as the scientific literature. The methodological approach followed is based on the research of scientific approaches as well as on scientific bibliography.

RESULTS AND DISCUSSIONS

This section presents the creation and promotion of the socially supported farming network, based on the methodology presented above.

The Position of the Network

As mentioned above, one of the main pillars of the Greek economy is the rural area, whose contribution both in the primary sector and in the later process of processing is enormous. However, in order for this chain to exist, a suitable part must be chosen so that all the parties involved can be suitably served, and at the same time the possibility of expanding the production chain. These figures have a large city like Thessaloniki.

The city of Thessaloniki is located in Northern Greece, a region where it is known for its agricultural products, possessing all the characteristics of the health and safety of the food produced and the economic advantages for the producers.

Let us assume, therefore, that a producer has begun to produce agricultural products on the outskirts of Thessaloniki. The technical advantages will be the close proximity of Souroti factory, where water purification and bottling is carried out, which enables the producer to have a continuous supply of clean water of good quality, the disposal of any waste is done by Municipal waste trucks every day so as to avoid contamination of the environment and the contamination of the food produced. And finally, the area has a relatively cold climate due to its location (it is amphitheatrically built by the sea), which is suitable for fewer hygiene problems.

The economic advantages include the Supplier Cooperative of Thessaloniki, which can distribute the product both on the Thessaloniki market due to an already existing customer network and the fact that the cost to the producer for the distribution of the product falls. The key importance of double location in the city is the fact that there is direct contact between the market (consumers) and the producer.

The Market Forces

When we talk about market forces, we mean supply and demand, something we see strongly because of the consumer's contact with the producer in this case. The producer, for his part, offers agricultural products, and consumers on their own side, are the demand for the products. The question is whether the two sides agree on the type of product, as today agriculture is not only conventional, but also agricultural products of integrated management and organic farming.

Nowadays, consumers are up to date and want to know what goes into their table, and in order to do so, they come in direct contact with the producers. This creates another kind of balance of market forces, not price, but quality. This "cooperative" between the producer and the consumer, where the cheap and the rewards are shared by everyone, is the so-called "community supported agriculture".

The origin of socially supported agriculture is not entirely clear. According to most sources, it began in the early 1960s in Germany, Switzerland and Japan in response to concerns about food security and the urbanization of rural land. Milestones were in 1984 when socially-supported agriculture began in the United States of America, and in 2005 where the federal bill was passed, which provided for the creation of the "Fieldeater Movement".

[7]How does a socially supported farming system work? A CSA can take several forms. First, a group of people can approach a producer and bind him or her to cultivate for them, or a producer can search for shareholders - associates - consumers. The most common form of CSA encounter is the second, where a farmer plans a cultivation plan and then looks for the shareholders - consumers. When found and agreed, the shareholder advances the amount of the agreement and the farmer is now

obliged to fully respect the cultivation program of the agreement. When harvest time comes, picking is usually done once a week from the farm or from a meeting point set up from the beginning.

Here is added the cooperation with the Thessaloniki Co-operative Association, which, having its own network of stores, can take over the distribution of products and use its stores as consumer reception stations. From this co-operation, the co-operative has significant advantages, since the vehicles transport the goods to the shops, so they have a fixed cost, which is reduced, thus creating economies of scale. This is how the core of the network is set up in a city like Thessaloniki, which offers many channels of cooperation.

The Educational Community

A "great" partner in the network is the tertiary space, as it is the matrix of science. In a network such as a socially supported farming enterprise, there could be no educational institution to provide its services. [4]

Services that include research, data analysis, guidance and counseling, as well as practical cooperation as many students who complete their internship in their studies continue their work in the same business. Research by the educational institutions will help the market improve, because as an outside observer the institutions see the mistakes and failures and point them out. Analyzing the kinds of existing data helps us to draw conclusions and make predictions, as much as we can, so as to prevent unpleasant events.

The advantage of Thessaloniki is that it has not only one but two large educational institutions in the tertiary area. With the first one of the largest Universities in the country, the Aristotle University of Thessaloniki and secondly the Alexander Technological Educational Institute of Thessaloniki one of the largest Technological Institutions in the country. The Faculty of Agriculture, Forestry and Natural Environment of the Aristotle University is active in the fields of plant production, animal production, rural economics, food technology and forestry technology, and the School of Technology of Agriculture, Food Technology and Nutrition of Alexander Technological Educational Institute (TEI) consists of the Technological Agronomist, Food and Nutrition and Dietetics Technologists. The graduates of these departments become the best possible workforce for staffing such a network. These specialties cover the range of all production, from the specificity of plant production during sowing and harvesting of the products in the field, the specialty of food processing technology (standardization and / or processing, standardization), up to the specialty of the rural economy in the role of the Financial Management Supervisor.

Of course, tertiary space is not the only level of education where it can support such a venture. Vocational High Schools are widely known in Greece, and more and more students choose to attend. The Department of Agriculture, Food and the Environment is a strong emerging sector as graduates from its departments have gained knowledge of the basic principles of food processing, management of natural resources and cultivation methods. This makes them desirable to perform auxiliary role duties in those of higher education graduates.

The Legal Dimension

Supervising Ministries for Agricultural Enterprises are, for the most part, the Ministry of Rural Development and the Ministry of Economy, Development and Tourism, with the subsidiary role of the Undersecretary for NSRF and the State Secretary for Industry. With the former being the coordinator for grants, and under the supervision of the Minister, there is the General Secretariat for Consumer Protection and Marketing, which is responsible for the procedures for setting up business.

[1] By changing to Law (2323/1995), which was superseded by Law (4264/2014) (Exercise of Out-of-Shop Activities and Other Provisions), it was imperative to find and develop a new model of sales by producers. According to the old Law, a producer had the right to sell his products on which territory he wished, as well as to refrain from issuing proofs, since it was stipulated by the relevant license that he had the transfer of his products by means of delivery notes, so that the cost is reduced, so that the consumer purchases at cheaper prices. The new Law, in place of the old one, stipulates that a producer who wishes to sell his agricultural products outside of

popular markets either can sell them through open-air trade but always within the boundaries of open markets (e.g. traditional local markets, where relevant permits are issued by the Region or, in some cases, at certain specific points of the Municipality, at specific days and hours (the permits are issued by the Municipality).

The new Law, however, gives him the right to sell his products directly to consumers from his headquarters without the relevant license, provided that he is tax-exempt. Because of Thessaloniki's urban transport network, you are able to transport a consumer easily out of town, thanks to the cooperation with the Thessaloniki Co-operative Association and the use of the branch network, the producer does not need either to issue a license or carry the consumer in the place of continuous travel. However, in order to achieve co-operation, the producer's business must have some legal form. It is initially proposed to give it the form of an individual enterprise because it is particularly widespread because of its main advantage being the great flexibility of the business decisions concerning the type of activity, the choice of technical methods and the size of production. For procedures, please contact the Public Financial Service where the company has its headquarters. An important advantage is that Thessaloniki is also home to Taxation of Public Limited Companies in addition to the PFS, so if the company grows to such an extent that it needs to change its form, then it is proposed to set up the Society Anonym and its membership in Thessaloniki TPLC.

The Financial Side

Thessaloniki, as the only city that is considered to be co-dominant in the world, could not have a developed network of various banking and financial institutions. Something that allows the producer to find financial sources and capitalize on modern logistics equipment. At this point comes the added trend of the days, the so-called Leasing. Leasing is the transfer of the right to use a fixed asset from the lesson to another person, the lessee for a certain fee for a specific period of time in the form of the lease. Thus, the producer has a valuable tool for reducing fixed costs and, by extension, can achieve competitive prices. [3]

The media

For their part, the local media, for example, radio stations (e.g., 99fm, 95.1fm, 94.5fm) can contribute to both advertising the business and promoting the entire network and making it widely known.

Organization and Management

In order to achieve better organization and management of both the business and the network, an electronic platform, similar to that of the United States of America, could be set up, where it was set up by Farmigo. This software enables a consumer to choose from the producers' profiles, the one he thinks best suits him. Producers in their own right have the option of linking a bank account to the platform so that consumers can pay them directly via Internet Banking. This platform can be a useful information hub for everyone, because it will collect a great deal of information where each network operator will analyze them for their own purposes. [2]

The Network

In schema (Fig.1) we can see the relations between all actors in the network, as we can also see every actor reacts with all other actors inside the network.

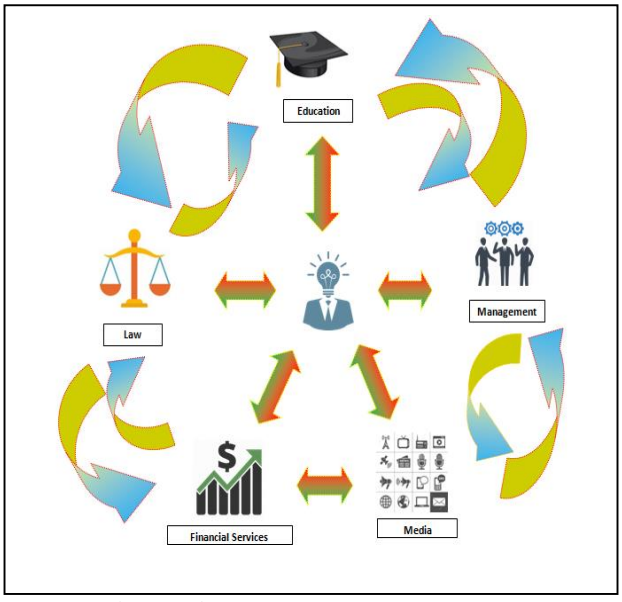

Fig.1. The reflection of relationships between the actors inside the network
Source: Personal opinion and design.

CONCLUSIONS

Of great concern is the fact that, while there are already socially supported farming businesses in the region of Thessaloniki, they do not have the rate of growth that should be for an agricultural enterprise in a purely rural country. The reason as mentioned above is because they have not yet developed the business together with other actors and have not entered the process of partnerships. In this context, it is proposed to inform both the producers themselves and those who may be involved in such an exercise.

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ASSESSEMENT OF THE TOURISTIC DEMAND IN THE DANUBE DELTA BY PROFILE AND MOTIVATION OF TOURISTS

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Abstract

The main purpose of this paper was to evaluate the tourist perceptions regarding the tourism development in Danube Delta and to understand the typology of tourists which travel in this area. In this context, it was carried out a questionnaire survey in 2017 on 169 tourists. The main results of our survey revealed a general positive attitude towards the touristic offers from Danube Delta Region in terms of accessibility, hospitality and touristic accommodation. It was observed a dissatisfaction regarding: promotion and image; the lack of local shops (foods and souvenirs); transport quality; recreational activities.

***Key words*:** *sustainable tourism, tourists' typology, motivation*

INTRODUCTION

Danube Delta received in the last years a special attention due to the elaboration of the 'Danube Delta Integrated Development Strategy (2030)' by the Ministry of Regional Development and Public Administration (MRDPA) and World Bank. The goal of the strategy was to transform this region in an 'integrated tourism destination with a rich portfolio of sustainable - nature and culture - based tourism products and services, along with relevant marketing activities' [8].

The challenges in the implementation of the strategy are much more complicated. We have to take in consideration the confusion in the present days in defining and understanding sustainable tourism. Since the '90s, numerous authors (Duffy[4], Banerjee[1], Saarinen[11]) were drawing attention on the need to define a better concept of this term. However, a number of works remained focused in offering solutions rather than clarifying the concept. We emphasize the papers of Eagles *et al.* [5] (about the characteristics of nature-based tourism and proposed management and planning tools), Buckley [2] (the relation between the usage of resources in tourism and natural conditions), Hiwasaki [6] (the promotion of community-centered tourism to assure a sustainable management of protected areas) etc[12]. In the last decade, many papers were concentrated on the connections of the tourism with other economic sectors [7] or on the necessity to extend the sustainable development measure to community level [13].

Like we may observe, the development of a sustainable tourism in Danube Delta needs a deeper understanding of local needs, beyond the proposed strategic measures - like brand management, tourism infrastructure development or local economies integration. Yes, we can support the development of tourism in biosphere reserves or protected areas, but how do we make it "sustainable"? According with Rotman [10], the Danube Delta is very complex, integrating areas with resources for cellulose and paper manufacturing industries, areas for hunting and fishing, areas for tourism and areas of scientific interest. Also, even the Danube Delta was affected in the last years by the economic crisis [3] there is an obvious increasing flow of tourists [9].

As a result, the objective of this research is to understand the typology of tourists which traveled into Danube Delta with the declaimed purpose to respond to the following questions: What are the elements of the tourist activities to be pursued in the future "integrated tourist

destinations"? Does the tourist of Danube Delta have the ability to turn into an ecological tourist? Do the present accommodations have the ability to adapt to the requirements imposed by the sustainability and to meet the needs of the tourists in the same time?

MATERIALS AND METHODS

Our survey was taking in account the following steps: online questionnaires - transmitted and received by social media (30 questionnaires); a survey on the participants to The Romanian Tourism Fair of Romania 2017 (139 persons).
The questionnaire had 24 questions regarding: the attitude towards tourism in general; the travel in Danube Delta; the attitude towards the tourism from Danube Delta (pollution, potential, accessibility, quality, safety, prices, etc.); the satisfaction degree.
Regarding the methodology, we emphasis the following remark: we selected local from Danube Delta (with a minimum stay of 5 years); the selection was random, based on their will to respond; the survey interval was 9-12 February 2017; we applied descriptive and non-parametric methods with IBM SPSS Statistics.

RESULTS AND DISCUSSIONS

The carried-out survey had 169 respondents, from which 58.6% male and 41.4% female. The main characteristics of our respondents are: 42% are from Bucharest (the capital of Romania); 55.6% are between 25-40 years old; 56.2% have a university degree; 62.7% are employees; 54.1% are indirect or indirect related with touristic field; 62% have monthly income under 3000 RON per family (around 665 euro); 23.1% visited Sulina, 22.5% Sf. Gheorghe, 11.2% Crișan, 8.9% Tulcea and 34.3% other villages from Danube Delta.

Frequency of the trip

The majority of the tourists visited the Danube Delta for the first time (53.3%). Men were visiting more often (55.6%) while the analyses by age revealed that 51.6% from the people over 40 traveled in Danube Delta more than one time. Crișan village and the villages inside the region were preferred destinations.

Decision to travel

The decision to travel was made with 1-3 month before by 39.4% from the tourists and in one month period by 35.5%. The tourists which plan the travel with over 3 months before have the following characteristics: 29.6% are from other villages than Bucharest; 25.3% are men; 27.4% are over 40 years old and 37.9% have less than RON 2,000 income. This type of people follows the touristic offers to catch discounts.
We also observed that are some categories of tourists with an unforeseeable behavior: 42.3% from the tourists from Bucharest; 37.4% from men; 46.2% from the persons with fewer than 25 years old and 40.6% from the persons with over RON 4,000. These persons prefer the “last minute” type of touristic offer.
Another important aspect was that some villages (like Sulina and Sf. Gheorghe) were preferred by the tourists who make the reservation with 1-3 month before the travel, Crișan village by the tourists which decide with over 3 months before travel and for other category the travel is planned with maximum 1 month before.

Reservation pattern mode

29.6% form the tourists make the reservation based on their knowledge about the place, 29.0% based on recommendations and 26.6% based on on-line information. Only 11.2% used the services of a travel agency (12.1% from men, 15.4% from the people with under 25 years old, and 14.7% from the tourists with income between RON 3,000-4,000).
The reservations were made by telephone (30.8%), internet (24.9%) and travel agencies booking sites (23.7%). Around 20% from the tourists didn’t make any reservation. By categories, we counted the followings: 27% from men make the reservation by phone and 22% through agencies; the women and the persons with over 40 years old use more the phone and the internet for reservations; the on-line reservations are used especially for Sulina and Crișan villages and 40% from the reservations in Tulcea were made through travel agencies.

Tourism travel' typology

From tourists, 39.6% travel with friends, 29% with the family members and 29% with family and friends. 40% from the inhabitants of other villages than Bucharest, the majority of men, the persons with over 40 years old and the persons with an income of RON 2,000-3,000 RON per family prefer to travel with friends. The travel with family is preferred by around 30% from tourists from Bucharest, women and persons under 25 years old. However, the majority of tourists travel in groups, not individually.

Accommodation preferences

Tourists prefer touristic boarding houses (40.8%), hotels (20.1%) and touristic villas (cottages, bungalows, etc). Camping and private homes were preferred only by 21% from respondents. Hotels were preferred by around 25-30% of people with age between 25-40 years old and persons with RON 2,000-3,000 per family. Touristic boarding houses were preferred by 61.5% from the persons with under 25 years old, 41.9% from the people with over 40 years old and the persons with an income between RON 3,000-4,000 per family. Our analyses revealed that the Danube Delta is preferred for average stays between 4 and 6 nights (44% of tourists) and 3 nights (28.4% of tourists). 51.5% of women, 50% of the persons with over 25 years old and 74% of people with an income between RON 3,000-4,000 per family prefer the average stays of 4-6 night. The stays over 6 nights are preferred by 22% of men and 19% of the persons with RON 2,000-3,000 per family. For the stays with 4-6 nights are preferred Sulina and Sf. Gheorghe.

Motivation and type of tourists

According with their motivation in choosing the Danube Delta as touristic destination, the tourists can be classified in the following categories:

(i)tourists focused on sport tourism (20.1%) - they associate rest and relaxation with fishing activities – a good niche to promote tourism products focused on fishing activities;

(ii)tourists focused on rest and relaxation (9.5%) - they associate rest and relaxation in the area with health and outdoor movement – the right message will be pedestrian or cycling touristic products;

(iii)tourists focused on local cultural aspects (14.2%) - they associate the local landscape with gastronomy and specific habits - cultural tourism products can be promoted (from visiting the local cultural objectives to the introduction of the specific local food preparation);

(iv)tourists focused on local biodiversity and cultural aspects (34.3%) - they come for the local natural landscape, considering the landscape as an ideal location for rest, relaxation and gastronomy – we may offer them local packages which combine walks in nature with visits to places of natural interest and locally grown-ups / restaurants (tourists who prefer the Danube Delta as a whole but do not prefer sports activities);

(v)tourists focused on local biodiversity, sporting activities and cultural aspects (20.7%) - they come to the area for scenery, boat trips and local gastronomy - packages based on the image of the Danube Delta, canal rides with boats (or other types of transport - e.g. canoeing) (tourists who prefer the Danube Delta as a whole but also want sports).

We can observe that the last two categories are predominant, accounting for about 55% of the respondents. Category 1 of tourism is preferred by 34.4% of people with over RON 4,000 per family and we found them especially in Crișan (about 42.1% of tourists). Category 2 of tourists is the least. About 18.6% of women and about 24.1% of low-income people appreciate the cultural aspect of the area falling into Category 3. Category 4 of tourism focused on biodiversity (without sports aspect) and is preferred by about 30%, with higher values for people over 40 (about 42%) and people with RON 2,000-3,000 per family (about 41%). Category 5 of tourism focused on the image of the area, including the sport aspect, is preferred by about 25% of men, 32% of people with RON 3,000-4,000 per family and we find it in 26% practiced in Crișan and Tulcea.

Satisfaction

Regarding the evaluation of tourist services in the Danube Delta, tourists appreciate the accommodation (77%), the staff (74%) and the local gastronomy (75%). Only about 68% of tourists were satisfied with water transport services, while about 22% remained neutral in

appreciation. Only 44% of the tourists were satisfied with the offer of sports activities (41% being neutral), while 57% were satisfied with the offer of recreational activities.

Perception

The overall perception of tourists was positive, over 80% agreeing that the stay was important, that they had new experiences, that the stay "deserved all the money" and that they were satisfied with the choice of the Danube Delta as a tourist destination. From total of respondents, about 82% said they would like to return to this tourist destination. If we analyze by category, we note that there is a higher desire to return to the area of: men, persons under 40 years old, employed persons and persons with over RON 2,000. Depending on the visited places, a higher percentage is observed in Crișan, Tulcea and other localities in the heart of the Danube Delta.

CONCLUSIONS

Regarding the opinion of tourists about the Danube Delta tourism, most of them believe that: The Delta villages are easily accessible from Tulcea, including for the elderly; guides are needed to move within the Danube Delta; the Danube Delta is unpolluted, safe and hospitable, but there are deficiencies in image and promotion and a lack of food and craft shops; the level of taxes, accommodation prices and the prices of goods and services are reasonable. Also, as regards the satisfaction of tourists, I noticed that most were satisfied with the accommodation location, staff behavior, local gastronomy and water transport services (a lower percentage of transport), but only about 44% of tourists were satisfied with the offer of sports activities and about 57% of the offer of recreational activities.

So, regarding the Danube Delta's appreciation as a tourist destination, the most important aspects are: ***safety and hospitality, nature and public cleanliness, existence of outlets (shops).*** The destination doesn't meet the tourist expectations regarding the access to information, the possibility of cultural activities, accessibility in the area and price levels. The general perception of tourists on the stay was mainly positive, over 80% agreeing that they are satisfied with the choice of the Danube Delta as a tourist destination and about 82% said they would like to return to this tourist destination.

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ASPECTS OF CULTURAL TOURISM IN BRAȘOV COUNTY WITH A SPECIAL LOOK AT THE PERIOD 2015-2016

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Abstract

As a branch of touris, cultural tourism has seen a tremendous development and diversification, both at European and international level, as a result of political and economic opening in the countries of Central and Eastern Europe on the one hand and, on the other, due to the competition between the countries with old traditions in this form of tourism. The purpose of the paper was to point out that cultural tourism remains one of the most important forms of tourism practiced in Brasov city and county, which contributes both to the economic development of the area and to a better knowledge of the Romanian values in general both within the country and at international level. The data were provided by Brașov County Council, the Brașov County Development Strategy 2007 - 2013, and National Institute of Statistics, Brașov branch. They were processed and converted into tables, graphs and then interpreted and analyzed. Of the total tourist accommodation units in operation, the hotels occupied 42.7%, agrotourism pensions 20.9%, tourist pensions 18.1%, tourist villas 5.9%, tourist cottages 4.0%, hostels 4%, motels 2.5%, campings 1.4%, and other types of reception structures 1.1%. As a result of 771 tourist activities, it is noticed that the number of tourists arrived in September 2016 was 108,308 persons, of which 83,299 Romanian tourists (76.9%), and 25,009 nonresident tourists (23.1%). In January-September 827,574 tourists (82.4% Romanians and 17.6% foreigners) recorded a 10.3% increase compared to January-September 2015. Regarding the origin of the tourists, the most numerous are from Germany, 1,006, registered in March 2016, followed by Spain, with 816 and Israel, 793. The least numerous come from Russia, arriving especially during the winter holidays.

Key words**:** *cultural tourism, tourists, tourist attractions, patrimony, material culture*

INTRODUCTION

The unique features of Romania are represented by the rich cultural heritage in relation to the neighboring countries, and Brasov County is a well known example among the counties of the country for its treasures such as: churches of different denominations, monuments and historical buildings, the magnitude of the architecture, the large number of fortified churches, archaeological sites, castles, architecture and rural ethnography, specific architectural styles through the synthesis of the oriental elements with the Western ones, together with the elements of the Romanian folk art, the memorial houses of the great cultural personalities at the international level: Andrei Şaguna, Gheorghe Bariţiu, Johannes Honterus, the cultural wealth due to the multiculturalism of Brașov through the presence of a large number of minorities, exhibits of the great western and oriental cultures.

In this context, cultural tourism is a form of valorisation of anthropogenic resources and that is why in its scope can include also the urban tourism and the rural-ethnographic tourism.

MATERIALS AND METHODS

To conduct this work, it was carried out a review of studies mentioned in literature which treated topics such as urban tourism, cultural tourism, heritage and tourism potential natural and human, infrastructure general and specific tourism sector, movement and tourism demand. Typology research work was used

both under the qualitative and quantitative aspects, concerning several areas of tourism.
In case of the qualitative research, there were applied the following research methods: data and information collection from the literature that could be accessed, and official documents, and observation method. In case of the quantitative research, there were used the following research methods: analysis method and data processing, graphic and cartographic method, the method of observation and interpretation.
The empirical data were provided by the following institutions: Brașov County Council, the Brașov County Development Strategy 2004 - 2020, and National Institute of Statistics, Brașov. The data were processed and converted into tables, graphs and then interpreted and analyzed. The data used in this study are part of the textbook on the desk.

RESULTS AND DISCUSSIONS

Cultural tourism necessarily implies the notion of patrimony, represented by the material and immaterial components of the identity of any society.
The material heritage includes museums, monuments, architectural ensembles, art towns, villages with well-preserved traditions, archaeological sites, gardens, edifices of a religious or military nature. The immaterial patrimony includes cultural holidays, cultural traditions and skills accumulated over time [1].
The tourist flows in the cultural tourism are characterized by their own clientele which can be either specialized in a certain theme (able to travel impressive distances to capture another facet of their passion) or attracted to all that is cultural or occasional, which is usually a majority, and consists of those who are on vacation or holiday for recreation and entertainment, and also would like to visit the anthropic tourist attractions in the area where they are [5].
Another characteristic of the flows that contribute to the achievement of cultural tourism is the belonging of the participants to higher socio-professional categories or with a medium and high level of education: students, students, intellectuals and therefore its mass character is uncertain. The urban population is predominant in the formation of tourist flows [6].
Cultural touring practices are also quite different, ranging from visiting museums and monuments to the actual knowledge of their heritage, to their simple use as a decoration of playful practices (attending a café or a bar near a patrimony, for example) [8].
Cultural tourism in Brasov County is based, in particular, on the basis of the touristic material it has at its disposal, being indispensable for the development of tourist activity.

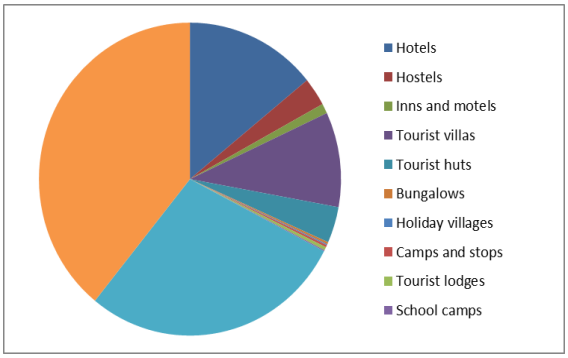

Fig. 1. Types of tourist accommodation establishments in 2015 in Brasov County
Source: Own determination.

Table 1.Touristic material basis in Brasov County in 2015

	No. of units	**(%)**
Total units	886	100.0
Hotels	125	14.1
Hostels	26	2.9
Inns and motels	9	1.0
Tourist villas	87	9.8
Tourist huts	33	3.7
Bungalows	2	0.2
Holiday villages	1	0.1
Camps and stops	2	0.2
Tourist lodges	3	0.3
School camps	1	0.1
Tourist boarding houses	250	28.2
Agrotourist hostels	347	39.1

Source: National Institute of Statistics, Brașov, 2015

Analyzing the touristic material basis in Brașov County in the year 2015 (Table 1), it was noticed that the most numerous units are, in the descending order, the tourist pensions with a number of 347 (39.1 %), followed by the tourist pensions, 250 (28.2 %), and the

lowest number being recorded by holiday villages and school camps (0.1 %) [9].

Table 2. The structure of tourist accommodation capacity in Brasov County in 2016

Accommodation units	Weight %
Hotels	42.7
Agrotourist boarding houses	20.9
Tourist boarding houses	18.1
Tourist villas	5.9
Tourist chalets	4.0
Hostels	3.4
Motels	2.5
Campgrounds	1.4
Other types of reception structures	1.1

Source: National Institute of Statistics, Braşov, 2016

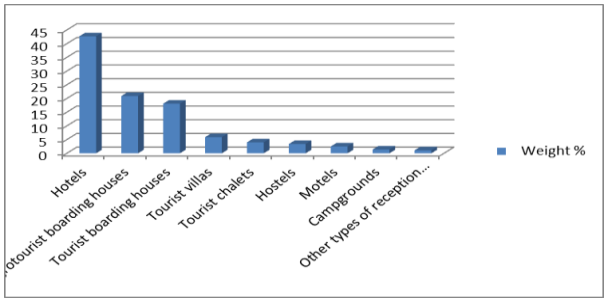

Fig. 2. Accommodation capacity in Braşov County (%) in 2016
Source: Own determination.

In the first nine months of 2016, by 10.3% more visitors came and stayed in Brasov County than in the same period of the previous year.
In structure of the total tourist accommodation capacity in operation (Figure 2) consists of: 42.7% hotels, 20.9% agrotourism pensions, 18.1% tourist pensions, 5.9% tourist villas, 4.0% tourist chalets, hostels 3.4%, 2.5% motels, camping 1.4%, and other types of reception structures 1.1% [9].

Table 3. The classification of the accommodation units depending on the number of stars in Brasov County

Accommodation units	Weight %
5 stars	3.7
4 stars	21.1
3 stars	52.3
2 stars	17.0
1 star	4.2
Without classification	1.7

Source: National Institute of Statistics, Braşov, 2016

The classified accommodation units (Figure 3) with 3 stars represent 52.3% of the accommodation capacity in operation, followed, in descending order, by 4 stars (21.1%), 2 stars (17.0%), one star (4.2%), 5 stars (3.7%) and unclassified (1.7%).

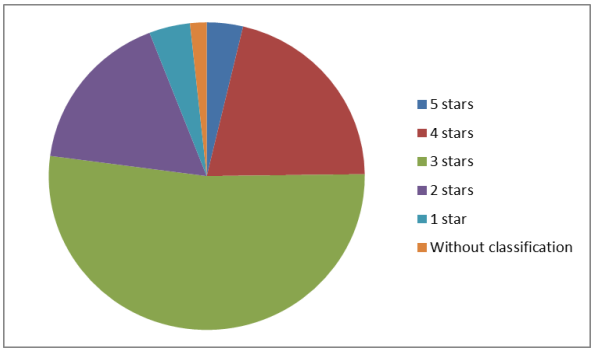

Fig. 3. The classification of the accommodation units in Braşov county by stars
Source: Own determination.

The average length of stay in 2016 was 1.9 days (equal for both for the Romanian and foreign tourists), and equal to the one recorded in September 2015, according to the data provided by the National Institute of Statistics, Braşov.
In the Central Region of Romania, Braşov County occupies the 1st place both for arrivals and overnight stays (42.1%, respectively 38.2%).
At the national level, Braşov county comes on the third pposition, after Constanţa County and Bucharest Municipality, both in arrivals and overnight stays, with 9.7% and 7.9% respectively, according to National Institute of Statistics, Braşov [10].

Table 4.Arrivals in tourist reception facilities

County of Brasov	Total	Romanian	Foreign
September 2015	95,090	73,682	21,408
September 2016	108,308	83,299	25,009
September 2016 versus September 2015 (%)	113.9	113.1	116.8

Source:National Institute of Statistics, Braşov,2016

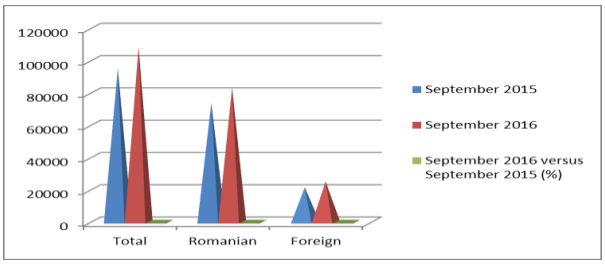

Fig.4. The number of tourists arrivals in Braşov county
Source: Own determination.

As a result, of the number of 771 tourist activity units (Figure 4), the number of tourists arrived in September 2016 was 108,308, of which 83,299 Romanian tourists (76.9%), and 25,009 foreigners (23.1%).

In January-September 2016, there were 827,574 tourists (82.4% Romanians and 17.6% foreigners) meaning by 10.3% more compared to January-September 2015.

The increase in the number of Romanian tourists arriving in Brașov County takes place on the background of promoting the area at national level. As regards international tourism, there is a decrease due mainly to the competition of the European countries with tradition in this field, amid the slump in the world economy [10].

Table 5. Tourists' overnights in the tourist reception structure in 2016 compared to 2015

County of Brasov	Total	Romanian	Foreign
September 2015	185,080	141,793	43,287
September 2016	202,795	154,123	48,672
September 2016 versus September 2015 (%)	109.6	108.7	112.4

Source: National Institute of Statistics, Brașov

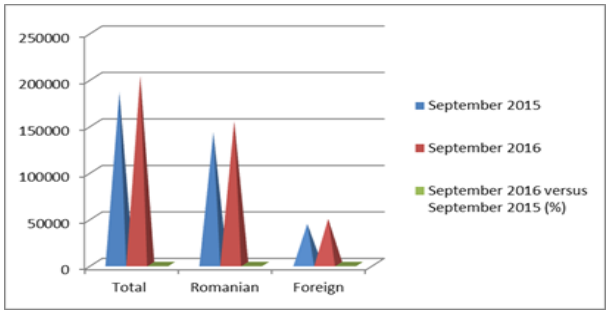

Fig.5. Tourists' overnights in the tourist reception structure in September 2016 versus September 2015
Source: Own determination.

The number of overnight stays (Figure 5) was 202,795 in September 2016, by 31.0% less compared to the previous month and up by 9.6% compared to the same month of 2015. The Romanian tourists' stays increased by 8.7%, in September 2016 compared to the corresponding month of the previous year, while the foreign tourists' overnight stays increased by 12.4%.

In January-September, the 1,643,848 days of accommodation (81.3% Romanians and 18.7% foreigners) recorded an increase of 5.3% compared to January-September 2015.

In September 2016, compared to the corresponding month of the previous year, in Brasov County the overnight stays were by 10.96% higher, according to the latest data published by Brasov County Statistics Department.

The highest occupancy rate, taking into account the number of overnight stays in the ranking of counties, is occupied by Brasov county with 38.2%, followed by Mures County (19.3%), Sibiu County (16.8%), Covasna County (11.8), Harghita County (8.2%), and Alba County (5.7%).

The average length of stay was 2.1 days (2.1 days for Romanian tourists and 1.9 days for foreigners), equal to September 2015.

Between January and September 2016, in the Central Region, overnight stays increased by 10.2% compared to the corresponding period of 2015. The average duration of the stay was between January and September 2016 of 2.1 days (equal to the romanian tourists and foreign ones) lower than the same period of 2015 (2.2 days), according to data provided by National Institute of Statistics, Brașov.

International tourism is deficient in the Brasov area due to its seasonality and due to the fact that most of the tourists come from neighboring countries. Elitist, play and other forms of tourism are not well developed, and visitors arriving in Brasov from a long distance are still rare [11].

Table 6. The main countries of origin of foreign tourists visiting Brasov County in March 2015 compared to March 2016

Country of origin	**Number of tourist**	
	March 2015	March 2016
Germany	876	1,006
Spain	452	816
Israel	582	793
Italy	402	665
United Kingdom	465	504
Bulgaria	304	486
France	488	452
USA	431	386
Hungary	167	226
Russia	198	187

Source:National Institute of Statistics, Brașov

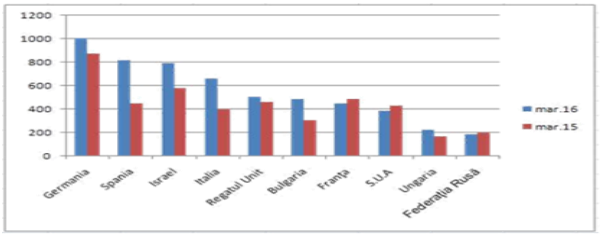

Fig. 6. Main countries of origin of foreign tourists - March 2015 compared to March 2016
Source: Own determination.

Regarding the origin of the tourists (Figure 6), the most numerous are from Germany, 1,006 visitors, registered in March 2016, followed by Spain, with 816 and Israel, 793. The fewest came from Russia, arriving especially during the Winter holidays.

In the county of Brasov, cultural tourism presents several forms. Thus, according to its mode of organization, it can be: organized, not organized (on its own) and semi-organized (mixed); according to the degree of mobility they meet: travel tourism and itinerant tourism. The two forms of tourism are called to be developed in a balanced and harmonious way, because they influence the seasonality of the activity and, implicitly, its efficiency. According to the periodicity with which the tourism forms are achieved, there is a continuous tourism developed throughout the whole year, the so called "seasonal tourism" practiced in certain seasons of the year [9].

Given the fact that Brasov county is predominantly a mountainous county, the tourism character of its territory is double (during the hot season of the year: especially from 1 May to 15 September and during the cold period between 1 December and 15 February). There are isolated touristic events at other times of the year (during winter or spring holidays), but they do not even reach the extent of the activities of the two peak seasons [9].

A recent research work identified that Brasov county patrimony inlcudes 150 tangible and 75 intengible items of heritage. This is a reason to consider the area of Brasov as a key destination for cultural tourism.

However, many of the the fortresses, monuments, such as Fagaras and Rupea Fortresses need restauration and rehabilitation works [11].

Besides the old historical attractions for visitors, Brasov county could offer new attractions based on the transformation of the old industrial units in new modernized spaces destined to promote local culture represented by workmanships, handicrafts, and souvenirs shops which could create jobs and be an additional income source for many people from the countyside. At the same time, traditions could be maintained and developed and promoted among tourists.

The cultural potential of Brasov county is represented by impressive fortesses, castkes, historical houses, Saxon churches unique in the world, etc. Howevr, many of the items included in the cultural and historical heritage such as hostorical buildings, churches, castles are not enough promoted among tourists becuase of the status of the buildings which are not yet restored.

The city of Brasov itself is one of the best preserved medieval cities in Romania. Many of its attractions such as The Black Church, the Schei District, the Sfatului Square, the defence walls of the old fortress, its towers and bastions are just a few examples of high importance for the tourism development.

In the county, the medieval fortresses from Codlea, Făgăraş, Prejmer, Harman, Rasnov and Rupea are objectives which attract more and more visitors both from Romania and from abroad.

Also, the peasant fortresses such as the ones from Bod, Cincşor, Codlea, Cristian, Ghimbav, Hălmeag, Măieruş, Prejmer, Rotbav, Sânpetru, Feldioara-Marienburg, built by the Romanian and German residents in the villages during the 13th and-16th centuries, represent a model of medieval architecture in Transilvania [8].

Impact of tourist activities on the environment in Braşov county

The development of the hospitality industry and transport infrastructure in recent years has led to overgrowing of mountain areas in other periods not influenced by humans.

Thus, areas such as Prahova Valley, Braşov Depression, Postăvarul Massif have experienced a strong anthropomption in the last period, this phenomenon being felt even in

harder areas such as the Făgăraş, Piatra Craiului and Ciucaş Mountains [10].

Tourism can also be a positive factor, of which both the protected areas and local communities could benefit, if it is planned and managed in such a manner to assure its sustainability.

Tourism can be welcomed in or near protected areas if they respect the special nature of the area such as tourism knowledge of nature, cultural and educational tourism, or the activity of small, quiet groups in conditions where damage and pollution are minimal [4].

For the development of cultural tourism, it is recommended to improve transport networks as well as tourist information on different cultural objectives.

CONCLUSIONS

The tourist objectives on the territory of Brasov County in particular are of particular cultural, scientific, artistic, educational interest, many of which have a unique character at national and European level, characterized by a high degree of dispersion, which makes It is possible to visit them via tourist circuits in organized groups, or independently.

Cultural tourism has a national and international development in Brasov. It aims the development of an organized type of tourism that covers the whole year and offers high quality services.

The accommodation capacity is dominated by hotels which represent 42.7%, followed by agrotourism pensions 20.9%, and tourist pensions 18.1 %.

In September 2016, it was recorded the top number of toruists: 108,308 persons, of which 76.9% Romanians and 23.1% foreigners.

In January-September 2016, it was registered 827,574 tourists of which 82.4% Romanians and 17.6% foreigners, their number being by 10.3% higher compared to January-September 2015.

The main countries provinding tourists are Germany, followed by Spain, and Israel. The Russian tourists are less numerous, but they like winter season to spend their holidays. Cultural tourism remains one of the most important forms of tourism practiced in Brasov, contributing both to the economic development of the county and to a better knowledge of the Romanian values in general both within the country and at the international level.

However, tourism in the Brasov area is seasonal and this fact is determined by the highest share of tourists coming mainly from the neighboring countries. It is difficult to think that tourists from a long distance to come just for a few days in Brasov County.

Therefore, the strategy applied by the local council for the period 2014-2020-2030 is focused in objectives and measures to stimulate the flow of tourists and increase the arrrivals from many other countries in order to show them the high value heritage and contribute to the economic development of the county.

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ASPECTS REGARDING TOURISM POTENTIAL OF MUREȘ COUNTY

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Abstract

Mureş County is renowned for its generous offer to practice some recreational activities. The game has gained a European reputation here, imposing itself through diversity and quality of trophies. The fish offer is not inferior, the hydrographic network of the county is rich and there is a tradition of fish growth, correlated with a specific gastronomic offer. The main purpose of this paper is to know in all aspects and in depth the tourism potential of Mures County. In order to highlight the tourist potential, the exhaustive inventory of all the attractive resources from the analyzed territory was used in terms of the volume, diversity and quality of natural and anthropic tourism resources, tourism infrastructure and tourism services, and it was necessarily and objectively doubled creating a graphic and cartographic basis with rigorous hierarchies of all existing resources, as well as highlighting the interrelations that are established at the level of tourist regions in terms of supply and demand for certain tourist attractions. For this, not only the main development resources have been analyzedbut also the tourism types of the studied area, as well as the tourist infrastructure necessary for the development of tourist activities, and the tourist flows recorded in the territory of Mureş County. The number of hotels has recorded a significant increase from 23 in the year 2005 to 48 hotels in 2013. The number of seats has also increased from 6,093 places in 2010 to 9,840 seats in 2013. The number of overnight stays grew up from 521,610 in 2010 to 771,931 in 2013. Both the number of Roamanian but also of foreign tourists has significantly increased in the lsat years in this area of Transilvania. In 2013 the number of overnight stays of foreign tourists accounted for 138,774, and the number of Romanians reached 633,157. As a conlusion, tourism in Mures County has been continuously developing due to a better promotion of its heritage and higher quality services offered to tourists.

Key words**:** *tourist flows, natural, antropic resource, diversity, quality*

INTRODUCTION

Mureș County is located in the Central - Northern area of the country in the center of the Transylvania Plateau being situated between the meridians 23°55' and 25°14' East longitude and parallel 46°09' and 47°00' North latitude.
The county stretches between the high peaks of Căliman and Gurghiului to the Tarnavelor Plateau and the Transylvanian Plain.
The physical-geographic axis of the county is the Mures River, which crosses the NE county to the SV at a distance of 140 km, the river borrowing the name "Mureş" like the county. The county borders with the counties, Alba, Brasov, Bistrita Nasaud, Cluj, Harghita, Sibiu and Suceava.
The capital of Mures county is Targu Mures, a charming city, with numerous vestiges of the Neolithic, the Bronze and Metal Ages and Roman relics in the surrounding towns. The town was first attested in the year 1322, and since the 16th century, Targu Mures has become an important cultural and education centre. The city landmarks, attracting a lot of tourists are: the Culture Palace, dating from early 20th-century city hall with an outstanding stained-glass hall, housing some of main local museums, The Apollo Palace built in 1822 in the late Baroque style houses the local Art School, the Old Prefecture Building built in 1711, nowadays being used as workshops by the artists of Targu Mures, the Palffy House a model of Baroque architecture dating from the middle of the 17th century, which hosts the Music School of the University of Theatrical Arts of Targu Mures, the St. Michael Wooden Orthodox Church built in 1794 and being

considered the oldest church in the city, the Targu Mures Fortress built at the end of the 15th century with its six bastions, added at the beginning of the 17th century, and strong walls to protect the city against the attacks of the enemies, the Teleki Library, and many museums such as: Art Museum, Ethnographic and Folk Art Museum, History Museum, Natural Science Museum, History and Archeology Museum, "Ion Vlasiu" Painting Gallery and "Nagy Imre" Painting Gallery [10].

The large variety of important cultural and historical places, as well as the modern architecture of the city, the charming Rose Square situated in the center have attracted more and more tourists from the country and from abroad.

In this context, the paper aimed to evaluate and analyze the tourism potential of the Mures County in terms of accommodation capacity, tourist flows and demand.

MATERIALS AND METHODS

Consultation of the specialized bibliography was the starting point for research carried out with simpler or more elaborate scientific papers, statistical information and data, some data requiring careful filtering.

Tourism is analyzed and tracked through a system of specific indicators, based on a methodology of calculation recognized and used worldwide (accommodation capacity, tourist traffic, tourist demand).

The identification of existing and exploitable tourism resources is necessary to highlight the current offer and to forecast the future development of tourism. In this sense, the exhaustive inventory of all the attractive resources from the territory under consideration was made in terms of the volume, diversity and quality of natural and anthropic tourism resources, tourist infrastructure and tourism services, being also necessarily and objectively doubled by the realization a graphic and cartographic basis, with rigorous hierarchies of all existing resources, as well as highlighting the interrelations that are established at the level of tourist regions in terms of supply and demand for certain tourist attractions.

Thus, in order to obtain data on accommodation and tourist movements, we consulted the data sources provided by the Ministry of Tourism, the County Statistics Department of Mures, the National Statistics Institute and the consultation of unofficial data sources (specialized sites).

In the realization of the scientific path on the knowledge and the evaluation of the potential tourism activities in Mureş County there were used specific principles, methods and means of Georgraphy study in general and some methods peculiar to the geography of tourism. In the course of the study it was necessary to go through the specific work stages: the stage of information accumulation, the stage of the analysis, the deliberative stage, which eventually led to the drawing up of conclusions regarding the magnitude of the tourism phenomenon in the studied area. The research methods specific to geography were also considered: observation, analysis and synthesis, the means of operation (description, explanation, hierarchy) and the finite elements of the use of research methods (descriptive model, mathematical model or model cartographic).

RESULTS AND DISCUSSIONS

The most important in defining the tourist purpose remains the motivation, depending on which the tourist chooses their destination and leisure type. In Mureş County we can identify the main types of tourism practiced with the diversity of tourist potential and the main reason for tourism trips [1].

Thus, we identify several types of tourism: cultural tourism or visiting tourism that occupy the highest share, rural tourism and agritourism, religious tourism, curative tourism in the hills and plateaus between Mureş and Târnava Mare, recreational tourism, hiking, leisure tourism and hivernal, hunting tourism, fishing tourism, extreme tourism, business tourism, transit tourism has a fairly high share due to the existence of important rail and road arteries which interconnect and allow

tourist flows throughout the area , scientific tourism, school tourism, with a course both during the school year and during the holidays has a wide field of development [2].

Table 1. Tourist accommodation structures in Mures County in the period 2005-2013

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Total	102	119	120	121	107	123	142	214	235
Hotels	23	25	24	22	22	25	40	47	48
Hotels for youth	2	2	2	2	2	-	-	-	-
Hostels	1	1	1	1	1	3	4	5	5
Motels	8	7	6	6	5	5	8	14	15
Tourist villas	27	30	31	30	14	15	8	13	16
Touristic cottages	1	1	1	1	2	3	3	4	4
Urban touristic pensions	20	27	29	32	39	47	47	81	95
Agrotourist pensions	10	17	17	19	15	17	23	30	30
Camping and cottage units	4	4	4	4	2	3	3	3	5
Tourist stops	1	1	1	1	1	1	2	2	2
Bounga lows	1	1	1	1	1	1	1	12	12
Camps for pupils and prescholars	4	3	3	3	3	3	3	3	3

Source:County Department of Statistics – Mureș

In order to highlight tourist activity in Mures county we have processed data on accommodation capacity, number of arrivals, number of inmates of tourists.

In the analysis of the tourist structures with functions of accommodation was mainly approached from a quntitative point of view, and less from a qualitative point of view [3].

According to the National Institute of Statistics, the accommodation is divided into: hotels, motels, hostels, tourist cottages, bungalows,tourist lodges, tourist lodgings, campsites, cottages, holiday villages.

Mures County has registered significant increases in the number of structures from 2005 until 2013, according to the data provided by the National Institute of Statistics (Table 1). Starting from a general analysis, it is noted that in 2005, the total number of accommodation establishments was 102 and increased until 2008, when 121 tourist accommodation establishments were registered for tourists. In 2009, their number decreased compared to previous years, reaching 107, followed by a sharp increase to 123 units in 2010. This year, as many accommodation units as possible began to operate. So, in 2011 there are 142, their number growing rapidly until 2012, when it reaches 214, and in 2013 it will benefit from 235 accommodation structures, the highest value ever.

For a closer look at each accommodation structure, in all nine years of study, it can identify an ascending approach to the number of boarding houses, both urban and rural agrotourism, but also hotels in Mures county [6]. The number of hotels has varied since 2005 from 23 hotels to 22 hotels in 2009, but since 2010 it has grown significantly, almost doubling in only three years (48 hotels in 2013). However, urban tourism pensions have the largest development, reaching only 20 in 2005, and 95 in 2013, also accounting for the highest share of total accommodation accommodation in the last year of study. The bungalows have grown steeply in 2012, when there was a sharp increase from just one bungalow in previous years to 12, a number that continued in 2013. Although in 2005-2008 tourist villas had an important share in the total accommodation structure, the following years saw a decline, reaching a maximum of 31 villas in 2007 villas, at least 8 in 2011, their number increasing to 16 in 2013. Even though only two youth hotels were registered from 2005 to 2009, none of them has functioned since 2010. The chart of tourist accommodation establishments with touristic functions demonstrates significant oscillations in most units, however, tourist activities on the surface Mureş county are in constant development and very attractive for tourists who have a wide

range of options for choosing the accommodation [7].

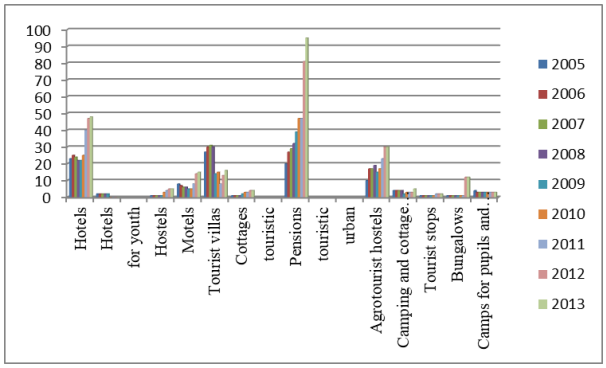

Fig.1.Tourist accommodation structures with functions of tourist accommodation 2005-2013
Source: Own determination.

In the series of data, "urban pensions" have been redefined in "tourist boarding houses", and agrotourism boarding houses include rural and agro-touristic pensions; "Hunting chalets" and "fishing huts" assimilate "huts".
Since 2009, "youth hostels" have assimilated "hostels" [9].
The National Institute of Statistics annually collects statistical data from tourist accommodation structures with an existing accommodation capacity of minimum 5 beds and more.
The existing tourist accommodation capacity by type of tourist accommodation the period 2010-2013, as presented in Table 2, had an upward trend overall, so that, from 6,093 places in 2010 it reached 9,840 seats in 2013 (Fig. 2).
Depending on the types of reception facilities, the hotels benefit from the highest existing accommodation capacity, with more than 2 600 seats in 2010 and reaching almost 4,400 seats in 2013 [11].
Tourism hostels have enjoyed a rapid evolution in terms of existing capacity, with only 848 seats in 2010, expanding to more than 1,700 places in 2013.
In general, all accommodation structures have increased their existing capacity over the 4 years.

Table 2. Capacity of existing number of seats (beds) in tourist accommodation establishments during the period 2010-2013

	2010	**2011**	**2012**	**2013**
Total	6,093	7,692	9,317	9,840
Hotels	2,612	3,728	4,313	4,395
Hostels	178	199	287	287
Motels	260	365	537	607
Tourist villas	378	338	430	604
Tourist cottages	89	89	125	121
Bungalows	224	224	224	224
Campgrounds	542	542	542	544
Tourist stops	147	187	187	140
Tourist cottages	0	0	0	12
Camps for pupils and preschoolers	486	486	486	379
Tourist guesthouses	848	904	1507	1786
Agrotourist hostels	329	630	697	741

Source:County Department of Statistics, Mureș

Only tourist stops have declined, the number of existing seats in these structures increased from 2010 to 2011, stagnating by 2012 and decreasing in the year 2013.

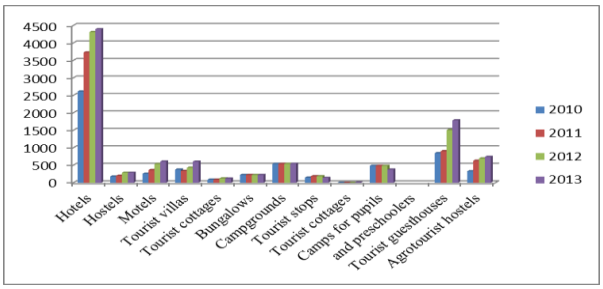

Fig. 2. Evolution of tourist accommodation capacity existing on tourist accommodation structures during 2010-2013
Source: Own determination.

Table 3. Arrivals of tourists in tourist accommodation establishments with tourist accommodation functions, by types of structures and types of tourists, in Mures County, during the period 2010-2013

Mures County		2010	2011	2012	2013
Total	Total	202,850	259,121	353,459	394,834
Total	Romanian	159,757	205,321	290,318	326,848
Total	Foreigners	43,093	53,800	63,141	67,986

Source:County Department of Statistics, Mureș

By the number of arrivals, according to the data provided by the County Department of Statistics Mures, Romanians' preferences for hotels, motels and tourist hostels are observed, the arrivals within these structures registering the highest values. Foreign tourists mostly

prefer hotels, and in units such as tourist chalets, bungalows, camps and pre-school camps, the number of their arrivals is very small (Table 3).

According to Fig. 3, both the number of Romanian tourists and the number of foreign tourists increased considerably in the four years, but the largest share belongs to Romanians arriving in Mures County, their number almost doubling from 2010 to 2013 [8].

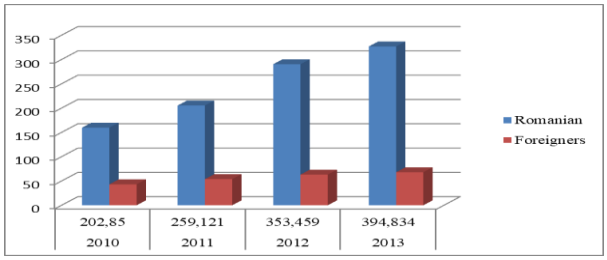

Fig. 3. Accommodations of tourists in tourist accommodation establishments, by types of tourists, in Mures County during the period 2010-2013
Source: Own determination.

Table 4. Overnight stays in tourist accommodation structures by types of structures and types of tourists during 2010-2013

Categories of tourists	2010	2011	2012	2013
Total	521,610	580,881	716,212	771,931
Romanian	427,710	470,552	583,528	633,157
Foreigners	93,900	110,329	132,684	138,774

Source: County Statistics Department Mureș

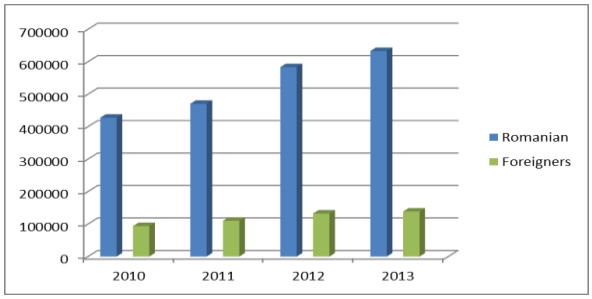

Fig. 4. Overnights stays in tourist accommodation establishments by type of tourists, in Mures County in the period 2010-2013
Source: Own determination.

The same situation as in case of arrivals is also found in case of the overnight stays of the Romanian and foreign tourists, where the values are steadily increasing and the number of Romanians is much higher than that of foreigners. Thus, the number of overnight stays increased from 521,610 in 2010 to 771,931 in 2013. In 2013 the number of overnight stays of foreign tourists was 138,774, the number of Romanians is significantly higher, reaching 633,157 (Table 4 and Fig. 4).

An important feature of the transport routes in the studied area is imposed by the natural environment, the arrangement of the hydrographical network and the major relief in the east-west direction, and the orientation of the major communication system along the main valleys [5].

The total length of public roads in the Mureş County is 1,959 km, their density being 29.2 km per 100 km² of territory, an indicator below the country average of 33.3 km per 100 km² of territory. Road condition does not meet the European standards.

A characteristic of the county is the development of specific public transport provision for short distance services and an average transport capacity. Thus, the main means of transport is the minibus, with a continuous trend of growth over the buses, the number of which is decreasing due to the degree of advanced physical wear [4].

Taxi services have grown a lot in recent years. There are also companies that offer the possibility of renting cars.

With 51.7 km of railways per 1,000 km², Mures County is above the country average of 46.4 km/1,000 km², as well as the region's average, 44.5% per 1,000 km². Mureş County is crossed by 328 km of railways, of which only 24.78% (86 km) is electrified, the share being below that of electrified railways at national level (35.87%).

CONCLUSIONS

The analysis of the tourism potential in Mures County has led to the following conclusions:

The study area can be referred to as a "cultural collage" due to the cultural, historical, ethnic, economic and social variety.

Correspondingly and keeping pace with the dynamics of the economic and social development of the county, as well as the quality of tourist resources, demands and exploitation prospects, the routes, the accommodation and leisure facilities have been modernized, the quality of the services offered to the local tourists and foreigners.

Mureş County is distinguished by an increasing number of tourists, accommodations, overnight stays.

The number of hotels has varied since 2005 (23 hotels) up to 2009 (22 hotels), but since 2010 it has grown significantly, almost doubling in only three years (48 hotels in 2013).

The accommodation capacity by type of tourist accommodation registered an upward trend from 6,093 places in 2010 to 9,840 seats in 2013.

The number of overnight stays increased from 521,610 in 2010 to 771,931 in 2013.

In 2013, the number of overnight stays of foreign tourists was 138, 774, while the number of Romanians is significantly higher, accounting for reaching 633,157.

Therefore, Mures County is an important spot on Romania's touristical map, attracting more and more tourists year by year. Its rich cultural and historical heritage is of high value and interest for tourists.

For this reason, tourism has become an important economic branch in the area, bringing its contribution to the economic development of the county.

The future belongs to new developments and investments in the diversification of infrastructure and services: accommodation capacity, service quality, and a larger variety of facilities.

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DEVELOPMENT STRATEGIES FOR RURAL TOURISM IN DOBROGEA

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Abstract

Rural tourism has a number of advantages and is characterized by diversity in time and space, and has recently become an essential element of rural development policy. Its practice allows for visible and clearly measurable results, and they contribute to the economic development of the area. The purpose of this paper is to highlight the importance of rural tourism in Dobrogea, tourism that has major implications in the local and national economy, by:generating economic benefits for local communities, organizations and authorities dealing with natural areas, with a view to preserving them; providing new jobs and additional sources of income for local communities; raising awareness - both by locals and tourists - of the preservation of natural and cultural assets. Dobrogea rural areas have a very valuable tourism potential, being valued by imposing development strategies, such as: developing and modernizing tourist infrastructure, preserving and protecting natural areas, existing historical and religious potential, developing and modernizing all bases touristic; development and modernization of accommodation services, making the most of the anthropic tourism; increasing the quality of the services provided and the qualification of the staff involved in tourism activities; attracting tourists through an extensive program of advertising and carrying out projects that highlight the elements of the cultural, historical and typical rural heritage.

Key words**:** *rural, resources, patrimony, tourist route, Dobrogea*

INTRODUCTION

Dobrogea is an area of contrasts, a humid but drought-free region, a place with a history of more than two thousand years, and at the same time the youngest land in Europe and a territory inhabited by people belonging to several ethnicities [2].

The tourist areas of Dobrogea (the Danube Delta and the Razim-Sinoe Complex, the southern shore, the Danube Delta and the Dobrogean Plateau) are valued by a diverse material base, with specific facilities, favorable for both mass tourism and alternative tourism (balneary tourism, leisure, adventure and leisure tourism, cultural tourism, professional tourism, ecotourism and rural tourism) [4].

The main reasons for the development of rural tourism are: social (agricultural crisis, youth unemployment), cultural (poor use of traditional buildings, disappearance of crafts, loss of traditions); of an economic nature (very small incomes from agriculture, difficulties in marketing agricultural products); and the factors that stimulate the development of rural tourism are: increasing the time for recreation; increasing interest in maintaining health; the authenticity and naturalness of life in the country; peace and comfort.

The purpose of the paper was the analysis of rural tourism in Dobrogea region as a basis for the future development startegy.

MATERIALS AND METHODS

To conduct this work it was carried out a review of literature where various authors treated topics such as urban tourism, cultural tourism, heritage and tourism potential natural and human, infrastructure general and specific tourism sector, movement and tourism demand. Both qualitative and quantitative research aspects were treated in several areas of tourism.

In case of qualitative aspects, there were applied the following research methods: the method of documenting, consulting the existing literature in the field and official documents, and the observation method.

In case of the quantitative aspects, there were used the following research methods: analysis method and data processing, graphic and

cartographic method, the method of observation and interpretation.
The data used were provided by the following institutions:Contanța County Council, Tulcea County Council, National Institute of Statistics, Tulcea and Constanța.

RESULTS AND DISCUSSIONS

The great variety of the Dobrogean landscape represented by the Danube Delta, the Casian Cave, Peștera Liliecilor (The Bats Cave), Cheile Dobrogei, the Măcin Mountains, the Agigea Seaside Dunes - the natural dunes of the Danube, the Harsova Canaralele, the Alah Bair Hill, Chituc Grind; (Topolog, Chichirgeaua, Carasu), streams (Casimcea, Topolog, Cross, Weddings), lakes (Buceag, Oltina, Baciu, Taşaul, Corbu, Siutghiol-Mamaia, Agigea, Tăbăcărie, Techirghiol), the limans, the Danube and the Black Sea; steppe vegetation and fertile soils, soil and subsoil resources, complete a picture that is fully conducive to tourism [4].
From an anthropic cultural point of view, Dobrogea is one of the most interesting areas because of the Romanian traditions, but also the Turkish, Tatar or Lipoven ones. Beyond a varied culinary offer, tourists also could find special wines [1].
In the 1960, rural tourism existed on the Black Sea coast in the villages, such as Costinesti, Mamaia-Sat, Agigea, May 2, and the Danube Delta (St. George and Murighiol) [3].

Table 1. Population of Constanta County on January 1st, 2016

Total	Urban	Rural
769.768	536,279	233,489

Source: National Institute of Statistics

There is a continuous increase in the population, especially in the urban environment, which has grown under the influence of the economic and cultural development of Constanta County. The reorganization of the port of Constanţa, as well as its connection with the interior of the country and with the outside world, also helped.

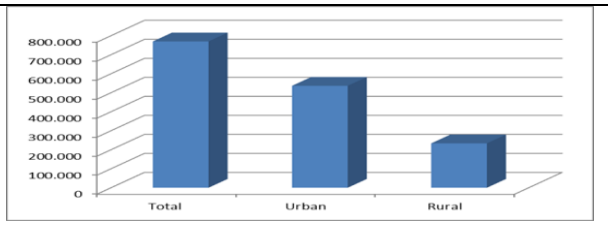

Fig. 1. Population in Constanta County on January 1st, 2016
Source: Own determination.

The most significant increase is the coastal zone, inluding Constanta, Năvodari, Eforie, Techirghiol, Mangalia cities and resorts, as a result of the development and modernization of the seaside and the intensification of Constanţa port activity.

Table 2. Population of Tulcea County on January 1st, 2016

Total	Urban	Rural
244,249	120,859	123,300

Source: National Institute of Statistics

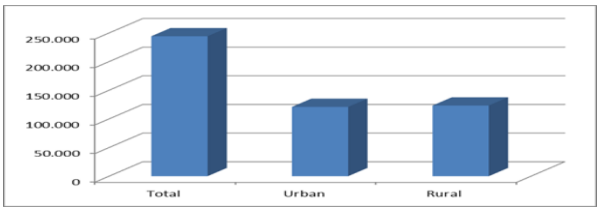

Fig. 2. Population in Tulcea County on January 1st, 2016

In Tulcea County, although the number of inhabitants in the city has greatly increased, the report is favorable to the rural population [1].
Concerning Tulcea County, the slower pace of its development and the low numerical growth of its population preserve a ratio of domination of the rural population to the urban one.
The development of rural tourism in Dobrudja is a strategic objective for local and regional policy because the communes and villages in this area have: unique natural landscapes in Europe and the world; great biodiversity preserved at the crossing of the Măcin Mountains (among the oldest in the world) with the newest portion of deltaic land; a historical and archaeological heritage of inestimable value (the oldest urban settlements in Romania); numerous churches and monasteries, true centers of Christianity spreading [5].

In the last years, on a wider scale, thematic rural tourism is practiced, which mentions the following types of tourism: in-kind tourism or ecological tourism; archaeological tourism or historical tourism; religious tourism; anthropic tourism; cultural tourism; curative tourism or balneary tourism; leisure tourism [8].

According to the data provided by National Institute of Statistics, there is an annual increase in the number of tourists who choose to visit the Dobrogea area. Thus, as a result of the analyzes carried out compared to 2014, in 2015 there is an increase of more than 10% in the number of tourists and in 2016 there was an increase of the number of tourists by 12% higher than that recorded on during the year 2015 [7].

Table 3. Evolution of the number of tourists in the counties of Constanta and Tulcea in the period 2014-2016

	2014			2015			2016		
	Total	Romanian	Foreign	Total	Romanian	Foreign	Total	Romanian	Foreign
CT	883.947	832.988	50.959	1.021.475	961.723	59.752	1.163.023	1.102.123	60.900
TL	66.242	52.760	13.482	69.076	53.384	15.692	69.412	52.242	17.170
Total	950.189	885.748	64.441	1.090.551	1.015.107	75.444	1.232.435	1.154.365	78.070

Source: National Institute of Statistics

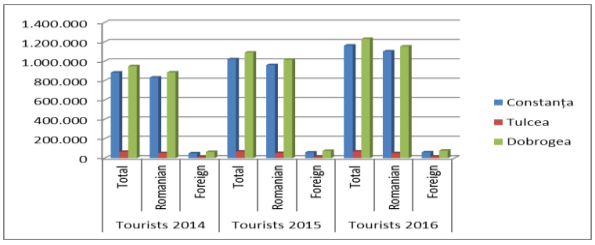

Fig. 3. Evolution of the number of tourists in Dobrogea region between 2014-2016
Source: Own determination.

The analysis of the data in Table 3 shows that in both counties the number of Romanian tourists is higher than that of foreign tourists. There is also a greater number of tourists in Constanta County, due to the seaside, the port by cruise ships, which bring a large number of tourists.

In order to increase the number of foreign tourists, there is the possibility to develop tourist programs with neighboring countries in Dobrudja. In this respect, the National Authority for Tourism has completed the ALECTOR project, a cross-border cooperation project between Romania and 6 countries, namely Turkey, Greece, Ukraine, Bulgaria, Moldova and Georgia.

ALECTOR is a project destined to capitalize the socio-economic potential of Dobrogea heritage resources and pursues the development of cross-border tourism products as well as to attract many tourists into the region mainly in the summer season. [9] The superior capitalization of the entire tourist patrimony provided by the rural areas of Dobrogea would lead to a significant increase in the number of tourists, which would implicitly result in the economic growth of the respective areas.

The SWOT analysis of Dobrogea area has pointed out the following aspects regarding rural tourism:

Strengths of rural tourism: natural factors (climate, relief, vegetation, the great variety of mineral waters recommended in the complex spa treatment); the multitude of archaeological sites and ancient vestiges that deserve to be highlighted; the existence of numerous monasteries, the living proof of preserving Christianity over the years; the diversity of easily accessible and harmoniously distributed natural and man-made tourism resources; keeping the architecture of settlements, preserving traditional occupations, preserving the folk port, traditional customs and customs; the diversity of organic agro-food products, traditional cuisine with regional specialties; non-existent or very low pollution in most rural areas.

The weaknesses of rural tourism: the road network in rural areas is almost non-existent; degradation of the archaeological objectives, degradation of the environment due to the lack of a waste collection system; the rapid degradation of rural architectural patrimony by depopulation of rural communities; the lack of tourist information and signaling systems in rural areas, the lack of local information and tourist promotion centers; poor diversification

of tourism services; poor quality of tourism services; lack of minimal knowledge of tourism management in rural areas; lack of technical and financial support for rural tourism promotion [6].

Opportunities: preserving and promoting cultural values through artistic, literary, traditional sports activities of ethnic groups; the existence of a great potential in the development of projects for the valorization of the folk techniques in the field of crafts; the development of partnerships in the tourism industry, as a form of capitalizing on the cultural potential,the historical heritage;the possibility of attracting new partners in international projects for the promotion of cultural landscapes,the development of cultural,historical and ethnic potential as leverage in regional development, especially in economically disadvantaged areas.

Threats: lack of unitary strategies at regional and national level regarding the sustainable development of cultural landscapes or, at least, their preservation; lack of financial resources of national administrations;loss of interest in traditional occupations and crafts;international competition in the field of tourism.

Development strategies for rural tourism in Dobrogea

In view of the above, some strategies are needed for the development and exploitation of the rural tourism potential in the Dobrogea area, such as:

Developing transport routes by: building roads in areas where they do not exist; maintenance, upgrading and proper signaling of the existing road network; maximum use of "Mihail Kogalniceanu" International Airport; capitalizing on the natural tourism potential by: preserving and protecting the natural areas; construction and modernization of recreational facilities; construction, modernization and information of camping sites; arranging, maintenance and upgrading of parking areas;development and arrangement of holiday villages and tourist villages; location of tourist signs, proper marking of tourist routes;capitalizing on historical and religious potential by: preserving the existing historical and religious potential;diversifying and organizing thematic touristic circuits; capitalizing on the anthropic potential by: preserving and preserving the architectural style specific to each area; preserving traditional crafts, capitalizing on local raw materials; the preservation of traditions and customs, the popular harbor; initiation and development of new tourism products and services, respecting local identity; valorisation of traditional local products (agricultural products, craft products); keeping traditional cuisine; the valorisation of the spa and recreation base by: maximizing the healing effect of the sea water,the highly mineralized sapropelic sludge,the springs from Mangalia (these springs contain mezotermal, sulphurous, bicarbonate, sodium, calcium); building new treatment bases and modernizing existing ones; keeping and upgrading existing beaches; setting up new beaches (eg Wedding Lake - here is therapeutic mud and a treatment base can be built); from a qualitative point of view, the services rendered are clearly superior; increasing the qualification of the staff involved in tourism; developing attractive thematic holiday packages; development and upgrading of related services (dispensaries, pharmacies, repair shops, etc);the development of thematic programs and trekking(eg cycling, wagon, horseback riding, fishing, water sports, etc.); internal and international promotion of treatment bases, as well as recreational facilities (fairs, exhibitions, congresses) [11].

CONCLUSIONS

The existing anthropic resources are very numerous, varied and valuable in Dobrogea region. A part of them is represented by the oldest anthropogenic resources which lead to the development of cultural tourism, therefore to a higher valorization of the tourist potential in the Dobrogea rural areas.

Touristic routes have a very high tourism potential, but they should be much better exploited by thematic diversification that should cover the entire Dobrogea territory, especially the rural areas.

According to the data provided by National Institute of Statistics, there is an annual

increase in the number of tourists who visited the Dobrogea area. Thus, as a result of the analyzes carried out compared to 2014, in 2015 there is an increase of more than 10% in the number of tourists and in 2016 there was an increase of the number of tourists by 12% higher than that recorded on during the year 2015.

In 2014-2016, in both counties the number of Romanian tourists is higher than that of foreign tourists. There is also a greater number of tourists in Constanta County, due to the seaside, the port by cruise ships, which bring a large number of tourists.

The Dobrogea rural areas have a very valuable tourism potential, which can be valued by imposing development strategies such as: developing and modernizing the tourism infrastructure, preserving and protecting the natural areas, the existing historical and religious potential, developing and modernizing all tourist bases; development and modernization of accommodation services, making the most of the anthropic tourism; increasing the quality of the services provided and the qualification of the staff involved in tourism activities; attracting tourists through an extensive program of publicity and carrying out projects that highlight the elements of the cultural, historical and typical rural heritage.

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USING THE ACCOMMODATION CAPACITY IN POIANA BRAȘOV RESORT DURING 2013-2016

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Abstract

Poiana Braşov, one of the most important tourist resorts in Romania, registered a large number of tourists in recent years due to the modern facilities and the high quality services offered to the tourists. The purpose of the research in this paper is to present the tourism potential of Poiana Brasov all aspects and all its features, as well as to achieve an overview of the present valorisation of this potential, identifying the possibilities for its superior capitalization in the future. The number of Romanian tourists arriving in Braşov County and Poiana Braşov has grown in the period 2013-2016, the preferences of Romanian tourists being directed to hotels, villas and hostels. The number of Romanian tourists arriving in Poiana Braşov is clearly superior to foreign tourists during the analyzed period. The evolution of the number of foreign tourists arriving in Poiana Braşov is oscillating, with a trend of growth in the period 2013-2015, followed by a decrease in 2016.

Key words**:** *travel, infrastructure, potential, financial resources, modernization*

INTRODUCTION

Tourist resort of national interest, Poiana Brasov is the benchmark of resorts where winter sports can be practiced [3]. It began in the 1950-1960 when it attracted through beauty, virginity and the first high-class tourism services, the pretentious German clientele. Poiana Brasov is a resort for winter sports in Romania, being a tourist attraction of international reputation, and a neighborhood of Brasov [5].
It features 12 different ski slopes, sports grounds, a lake, discos, bars and restaurants. Accommodation is provided in luxury hotels, hostels, villas or cottages [6].
In this context, the aim of the paper was is to assess the tourism potential of Poiana Brasov in all its aspects and features, to achieve an overview of the present valorisation of this potential, identifying the possibilities for its development in the future.

MATERIALS AND METHODS

The paper needed first an overview on the topic related to urban tourism, cultural tourism, heritage and tourism potential natural and human, infrastructure general and specific tourism sector, movement and tourism demand in Poiana Brasov.
The qualitative aspects were analyzed based on the following research methods: documentation regarding the literature that could be accessed and official documents and observation method. The quantitative aspects were evaluated based on classical research methods such as: data collection, and processing, data analysis, graphical and cartographical method, observation and interpretation.
The empirical data were provided by the following institutions: Brașov County Council, Integrated urban development plan for growth pole, Brasov in 2014, and National Institute of Statistics, Brașov Branch.
The data were processed and converted into tables, graphs and then interpreted and analyzed.

RESULTS AND DISCUSSIONS

The achievement of this paper imposed the detailed description of the tourism potential of Poiana Brasov resort, including both the tourist potential, consisting of natural and anthropic

attractions, as well as the technical and material basis of tourism, along with the general infrastructure that influences the tourism activity in the analyzed area; quantitative and qualitative elements of the tourist heritage elements of the Poiana Brasov resort, both by assessing the tourist potential and by analyzing the indicators of the tourist activity in the studied area; organizing and structuring the tourist potential of the Poiana Brasov resort by concretely determining and describing the forms of recreational tourism; of the tourist activities in this area, as well as by the tourist region of the studied area on tourist and geographic criteria.

The favorable natural environment, the favorable climate and accessible relief are the main natural factors that bring added value to this area from the tourist point of view together with the anthropogenic factors. [7] To analyze the degree of capitalization of the tourist potential in Braşov, some elements of tourism infrastructure needed to be presented. As regards the accommodation capacity, the data are structured in Table 1 [8].

Table 1. Structure of existing tourist accommodation units in Brasov County 2013-2016

Tourist unit / Years	2013	2014	2015	2016
TOTAL county, of which:	341	398	487	449
BRAŞOV	24	29	37	51
Hotels	11	12	15	18
Camping	2	2	2	-
Bungalow	9	9	9	7
Pensions	4	8	18	29
POIANA BRAŞOV	39	45	51	48
Hotels	13	15	16	14
Villas	8	9	11	11
Cottages	4	3	3	2
Holiday Village	2	2	2	2
Bungalow	15	15	14	15
Pensions	4	9	12	11

Source: Braşov County Statistics Department

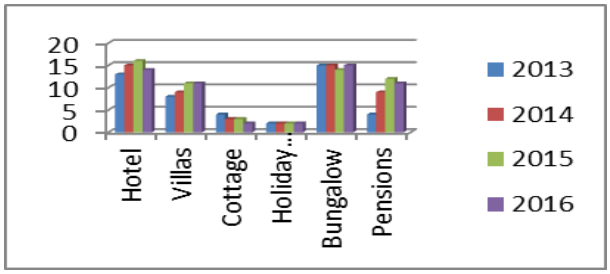

Fig. 1. Accommodation facilities in Poiana Braşov
Source: Own determination.

Both on the whole of Braşov County, but especially in the Poiana Braşov resort, it can be seen a significant increase of the number of accommodation units, from 36 in the year 2013 to 46 accommodation units in 2016. From the point of view of the type of unit, both in Braşov City and in Poiana Braşov, the largest share is held by hotels, complex units with higher comfort level and providing a wider range of services and quality higher.

Of the other types of units, the significant shares of bungalows and villas are the result of accessibility (low prices) and the development of youth tourism.

Table 2. Number of accommodation places in Poiana Braşov

Tourist units	2013	2014	2015	2016
TOTAL county, of which:	9,168	9,845	11,638	11,041
BRAŞOV	1,821	1,740	1,748	1,896
Hotels	1,040	1,131	1,157	1,235
Camping	207	207	349	2
Bungalow	39	39	29	10
Pensions	57	142	219	648
POIANA BRAŞOV	2,098	2,713	2,795	2,403
Hotels	1,671	1,997	2,009	1,841
Villas	91	139	181	228
Cottages	94	157	91	49
Holiday Village	39	39	39	39
Bungalow	88	88	84	88
Pensions	41	159	201	209

Source: Statistics Department of Braşov County.

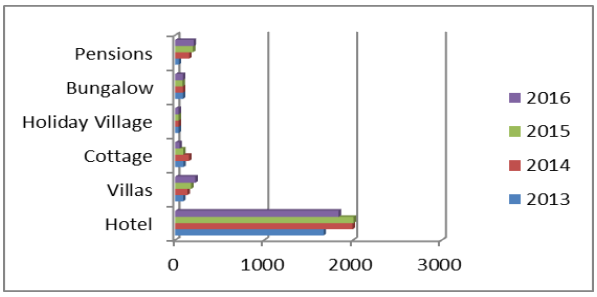

Fig. 2. Change in the number of accommodation places in Poiana Braşov
Source: Own determination.

Regarding the number of places of accommodation, one can notice the following: on the whole Braşov county, the number of accommodation places in 2013 and until 2016 had an upward trend, and in Poiana Braşov being noted an upward trend as well,

increasing from 2,098 seats in 2013 to 2,403 in 2016, due to the investments (Table 2).

Number of tourists

The number of tourists is one of the most representative and important indicators of tourist traffic. It is a physical, quantitative indicator and can take the form of: arrivals - departures of tourists, for international tourism and obtained from the statistics of the border recordings, accommodated persons, number deduced from the statistics of the means of accommodation [4].

Table 3. Arrivals of Romanian tourists in the establishments of tourists' reception with functions of tourist accommodation

	2013	2014	2015	2016
TOTAL county, of which:	219,145	251,070	329,511	353,119
BRAŞOV	54,138	49,531	59,832	67,169
Hotels	213,262	254,433	269,539	264,289
Camping	218	-	9	11,755
Bungalow	6,997	415	1,425	584
Pensions	41,111	49,177	67,851	81,770
POIANA BRAŞOV	60,729	74,960	80,240	83,820
Hotels	55,214	65,612	69,833	67,178
Villas	28,160	31,645	33,519	33,089
Cottages	11,491	10,550	12,502	12,990
Holiday Village	3,411	2,846	3,657	2,774
Bungalow	1,035	1,604	665	662
Pensions	28,026	25,171	35,353	50,383

Source: Braşov County Statistics Department

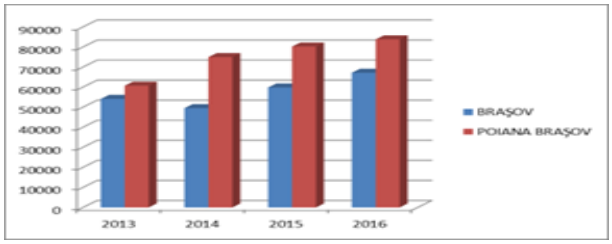

Fig. 3. The number of Romanian tourists arrivals in the accommodation units in Brasov County during 2013-2016
Source: Own determination.

The number of the Romanian tourists arriving in Braşov and Poiana Braşov has grown steadily between 2013 and 2016, the preferences of Romanian tourists being directed to hotels, 67,178 in 2016, 33,089 in villas and 50,383 in boarding houses. The number of Romanian tourists arriving in Poiana Braşov is well above foreign tourists during the analyzed period, accounting for 60,729 in 2013 and reaching 83,820 in 2016.
The evolution of the number of foreign tourists arriving in Poiana Braşov is oscillating, with a trend of growth between 2013 and 2015 being observed in Table 4, followed by a decrease in 2016. As in the case of the Romanian tourists, the preferences of the foreign tourists are directed to the type of tourist accommodation unit, the lowest number of lodgings being registered in the cottages.

Table 4. Foreign tourists' arrivals in the tourist facilities with functions of tourist accommodation in Brasov County in the period 2013-2016

	2013	2014	2015	2016
TOTAL county out of which:	71,751	76,637	93,542	88,572
BRAŞOV	33,250	31,788	43,589	43,848
Hotels	30,391	28,158	35,025	32,320
Camping	1,516	1,545	3,289	-
Bungalow	305	141	380	4,701
Pensions	1,038	1,944	4,509	5,831
POIANA BRAŞOV	29,866	28,472	33,781	29,223
Hotels	27,676	25,547	29,823	25,280
Villas	544	493	1,703	2,181
Cottages	27	34	9	9
Holiday Village	493	289	341	78
Bungalow	745	135	52	104
Pensions	441	2,031	2,175	1,821

Source: Statistics Department of Braşov County

Fig. 4. The number of foreign tourists arriving in the accommodation units during 2013-2016
Source: Own determination.

As regards the number of overnight stays or tourist days, these are calculated as the sum of the products between the number of tourists and the duration of the tourist activity expressed in days.

Table 5. Romanian overnight stays in the tourist accommodation establishments with functions of tourist accommodation

Tourist unit / Years	2013	2014	2015	2016
TOTAL county, of which:	748,727	794,386	855,503	947,783
BRAŞOV	125,756	124,639	126,336	167,821
Hotels	571,207	355,709	652,725	709,472
Camping	11,986	523	-	-
Bungalow	1,469	1,857	1,409	6,716
Pensions	49,717	-	-	-
POIANA BRAŞOV	170,437	187,781	193,436	195,423
Hotels	153,751	166,920	168,813	165,320
Villas	8,464	4,908	7,472	13,262
Cottage	27,251	24,303	23,885	25,178
Holiday Village	2,953	1,746	2,212	1,682
Bungalow	2,583	3,108	2,726	1,546
Pensions	2,058	8,887	10,096	12,338

Source: Brasov County Statistical Office

It is usually obtained by processing information from hotel unit statistics [2].

Fig. 5. The number of Romanian tourist overnights in Brasov County in the period 2013-2016
Source: Own determination.

The number of overnight stays of Romanian tourists in the tourist accommodation structures is upward throughout the analyzed period (2013- 2016), registering a maximum of 195,423 overnight stays in 2016.

Table 6. Foreign tourist overnights in the tourist accommodation establishments with tourist accommodation functions

Tourist unit / Years	2013	2014	2015	2016
TOTAL county, of which:	183,751	170,668	212,109	202,791
BRAŞOV	70,697	61,464	85,529	85,447
Hotels	66,085	53,106	65,995	59,537
Camping	1,727	2,509	5,705	-
Bungalow	382	229	870	6,753
Pensions	2,503	5,620	12,124	17,454
POIANA BRAŞOV	96,198	80,009	93,267	80,770
Hotels	89,283	72,117	83,749	72,271
Villas	1,869	1,261	2,909	3,541
Cottages	59	71	18	13
Holiday Village	1,459	904	491	326
Bungalow	2,052	898	254	582
Pensions	1,484	4,700	5,851	4,041

Source: Brașov County Statistical Office

Fig. 6. Foreign tourists' overnight stays in tourist accommodation establishments with tourist accommodation functions in Brasov County in the period 2013-2016
Source: Own determination.

In Poiana Brasov there is the highest number of hotels, 89,283 units of this type, in 2013 and 83,749 in 2015, and the lowest number, 13 nights in the year 2016, in the cottages.

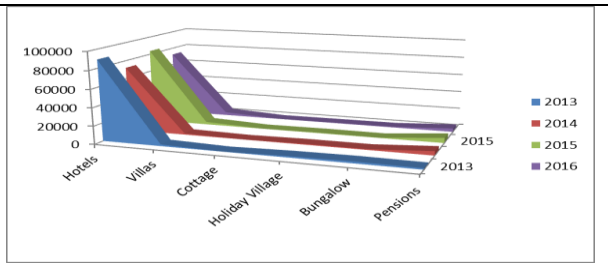

Fig. 7. Foreign tourist overnight stays in tourist accommodation establishments with tourist accommodation functions in Poiana Brașov in the period in 2013-2016
Source: Own determination.

The degree of occupancy

The most appropriate indicator to measure the level of economic efficiency is the utilization rate of the accommodation capacity. It reflects the outcome of all efforts made by economic agents to attract tourists in the area [1].
By type of units, the coefficient of utilization of the accommodation capacity has been significantly different in both Brasov and Poiana Brasov. The highest levels of occupancy were recorded in hotels, 23.90% for Romanian tourists and 13.88% for foreign tourists, holiday villages and hostels, while cottages and bungalows have reached lower values [10].

Table 7. The coefficient of utilization of the accommodation capacity with Romanian tourists in the tourist accommodation structures %

Tourist unit / Years	2013	2014	2015	2016
TOTAL county, of which:	18.30	18.20	19.28	19.41
BRAŞOV	22.61	19.50	23.08	16.96
Hotels	24.95	22.77	18.81	17.53
Camping	9.37	5.36	9.53	-
Bungalow	12.57	15.89	13.18	26.64
Pensions	19.26	13.96	14.45	10.19
POIANA BRAŞOV	22.34	20.47	19.91	22.28
Hotels	23.90	22.94	23.03	25.12
Villas	26.65	9.82	11.47	16.28
Cottage	2.13	5.88	7.58	7.40
Holiday Village	22.47	13.29	16.81	12.86
Bungalow	8.22	9.46	9.16	4.95
Pensions	6.45	13.04	14.03	16.32

Source: Brașov County Statistics Department

It can be seen from Table 7 and Fig. 8 that in Poiana Brașov the highest percentage, 26.65%, was registered for the villas in 2013 and the lowest percentage, 2.13%, was registered also in the year 2013 for cottages [10]

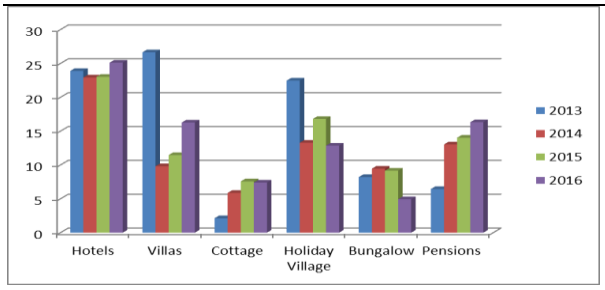

Fig. 8. The coefficient of utilization of the accommodation capacity, Romanian tourists, in Poiana Brașov
Source: Own determination.

Table 8. The coefficient of utilization of the accommodation capacity with foreign tourists in the tourist reception facilities

Tourist unit	2013	2014	2015	2016
TOTAL county, of which:	5.64	4.76	5.46	5.03
BRAȘOV	15.12	11.45	13.48	12.41
Hotels	17.57	13.07	17.78	13.23
Camping	2.35	3.41	4.65	-
Bungalow	3.27	1.96	8.21	26.87
Pensions	13.44	12.41	15.03	7.43
POIANA BRAȘOV	12.61	8.72	12.61	9.20
Hotels	13.88	9.64	11.42	10.98
Villas	5.88	2.52	4.46	4.33
Cottage	0.09	0.18	-	0.05
Holiday Village	11.10	6.88	3.74	2.55
Bungalow	6.53	2.73	0.83	1.85
Pensions	10.84	6.90	8.18	5.34

Source:Brașov County Statistics Department

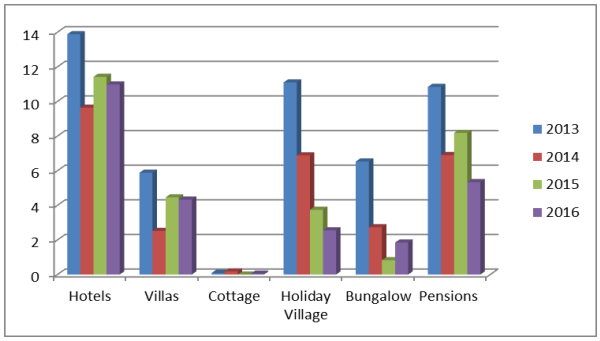

Fig. 9. The coefficient of utilization of the accommodation capacity,foreign tourists, in Poiana Brașov, 2013-2016
Source: Own determination.

Regarding the occupancy rate of the accommodation capacity, the highest percentages, 13.88%, were noted in the hotels in 2013, while the lowest percentages, with a value of 0.05%, were among the chalets, in 2016 (Table 8, Fig. 9).
The catering units are diverse and offer tourists traditional and international menus, including: Favorit Complex, Black Goat Restaurant, Soimul Restaurant, Poiana Ursului Restaurant, Caprioara Restaurant.

As far as transport is concerned, Brașov County has a well-represented network of public roads and is crossed by the main European and national roads, railways, represented by the railway buses connecting the city with the main national and international points [9].
It envisages the extension of the road and pedestrian network, as well as the arrangement of parking spaces at the entrance to the resort, in order to decongest the traffic.
Cable transport is present, for climbing, winter sports, these facilities play an essential role, stimulating or hindering their development.
Thus, there are 2 cable cars, Kanzel - the 2,474 m long Kanzel peak, the Capra Neagră Cabin - Postavarul, with a length of 2,809 m and Gondola Telegondola-Cristianu Mare, with a length of 2,096 m.
The main possibilities for agreement in Poiana Brasov are: practicing winter sports on the 3 slopes and slalom slopes, on the slalom slopes, on the 2 trampolines and on the slopes for amateurs, equipped with an artificial and nocturnal snow installation. Access is available with 2 cable cars, a telegondola and many ski lifts, skating, horseback riding, boating, bungee-jumping, parachute jumping, paragliding, deltaplan and climbing, swimming, ATV rides.
The tourism potential is also gained by the participation of tourists at numerous national and international festivals that attract a large number of tourists: the Days of Brasov, the Golden Stag and the Jubilee Festival, the Tower of the Cities, the Oktoberfest, the Contemporary Drama Festival, the Jazz and Blues Festival, Opera, Operetta and Ballet Festival, International Chamber Music Festival.

CONCLUSIONS

Poiana Brasov is the most famous resort for winter sports in Romania and also an important international tourist center. It has 12 ski slopes with varying degrees of difficulty, sports grounds, a lake, discos, bars and restaurants. Accommodation is mostly provided in luxury hotels, hostels, villas or cottages.

Poiana Brasov has the densest and most modern mountain tourism equipment in our country. Here we meet two, three and four-star hotels, equipped with swimming pool, showrooms and conferences, a horse-riding center, sports grounds or tourist hill. It has three downhill slopes and huge slalom, from a special slalom trail, two trampolines and an artificial lake for summer sports. The resort is equipped with two cable cars and one telegondola that provides access to the highways of the Postavaru, to which several teleski lines are added seasonally.

The number of Romanian tourists arriving in Braşov County and Poiana Braşov has grown in the period 2013 - 2016. The Romanian tourists as aweel the foreign ones prefer to accomodate in hotels, villas and hostels.

The number of the Romanian tourists arriving in Poiana Braşov is clearly superior to foreign tourists during the analyzed period.

The number of foreign tourists arriving in Poiana Braşov has varied, with an ascending trend in the period 2013-2015, followed by a decrease in 2016.

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THE QUALITY STATISTICAL EVALUATION OF BAKERY FUNCTIONAL PRODUCTS FROM DIFFERENT CEREALS FLOURS MIXTURES, WITH A HIGH CONTENT OF β-GLUCANS

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Abstract

The aim of this research was the statistical evaluation of the effect of fibers rich flours addition, namely oat, barley and millet flours, in wheat flour (15% and 30%), on the dough technological parameters, as well as on the main bread quality parameters. In this regard, there have been analyzed: flours technological water absorption, dough pH after kneading, pH after fermentation, temperature after kneading, temperature after fermentation. The quality bread analyzes were: pH, moisture, porosity and volume. The results showed that water absorption increase extremely significant in oat and barley (30%) bread. Temperatures after kneading increased, especially in millet bread. Kneading and fermentation determined significant decreases of fibers rich dough pH. The Spearman correlation between the dough technological parameters (n=7) showed that the temperature after kneading correlated negative significant with pH after kneading (r=-0.821). An extremely significant positive correlation has been established between dough pH after kneading and dough pH after fermentation (r=0.955***). Water absorption influenced bread moisture by 49% (r^2=0.49). Bread with 30% millet flour, showed a significant increased porosity, against wheat bread (t=3,531*). The increase of water absorption decreased the porosity by 44% (r^2=0.44) and the increase of temperature after kneading influenced the porosity increase by 51%. Flours pH (r^2=0.41) and bread moisture (r^2=0.41) influenced most bread pH. Bread volume did not correlate with any parameter. Functional bakery products with added fibers and increased content of vitamins, proteins and minerals, from oat, barley, and millet, help to maintain the consumers health.*

Key words: *barley and oat flours, β-glucans, functional bakery products, technological and quality parameters, wheat and millet flours*

INTRODUCTION

Consumption of products derived from cereals, mainly bread, dates back more than 12,000 years, being synchronous with the beginnings of agriculture. The prevalence of these products in human food is overwhelming in most cultures, in warm and temperate areas. Thus, cereals cultivation and processing is the basis of a global economy, estimated at about 8 trillion US dollars in 2016 [13]. More and more competitive technologies, as well as the global competition, have lowered companies profit rates on classical product segments (cereals flours, usual bakery products, breakfast cereals etc.). At this point, most companies in these industries are oriented towards gaining added value, by creating and delivering functional food.

Functional food includes a range of biochemical components (especially fibers and antioxidants) associated with a number of benefits, like maintaining health and protection against diseases such as: cancer, cardiovascular and degenerative diseases [2, 4, 5, 12, 14]. Due to a large-scale consumption in society, cereals products can be the most important vectors for the dissemination of these biochemical components, namely active principles [16, 24]. Moreover, cereals products are food systems that preserve the nature and chemical-physical properties of these active principles. There is an impressive number of studies on the positive effect of β-glucans in

diets, on the proper functioning of the immune system or the cardiovascular and digestive system [5, 6, 9, 10, 21]. The mechanisms by which these compounds positively influence the state of health are based on the reduction of serum and plasma cholesterol [1, 11] or on the reduction of postprandial glycemic response [3, 17, 22].

β-glucans are polycarbohydrates constituents of the cell walls in the aleuronic layer or cereal endosperm. Concerning the structure, these ones are polymers formed by glucose molecules, 70% joined by β-(1-4) glycosidic bonds and 30% by β-(1-3) glycosidic bonds [8]. The largest amounts of β-glucans are found in barley (3-11%) and oat (3-7%). For rye and wheat the values reported in the literature are significantly lower (1-2%) [5, 23].

The purpose of the paper and related research was the statistical evaluation of the effect of oat, barley and millet flours addition in wheat flour, on **dough technological parameters** obtained from mixtures of flours, as well as on the main **bread quality parameters** obtained from mixtures of flours dough.

MATERIALS AND METHODS

To carry out the research, the following assortments of flours were used:

- **dark wheat flour**, with a natural high content of protein (no gluten added), produced by Farinsan SA, from harvest 2016, having the following features: pH 6.543±0.040, moisture (%) 13.950±0.050; ash content (%) 0.993±0.030; protein content (%) 17.567±0.058; wet gluten (%) 42.400±0.529; gluten index 89.660±2.081; falling number 421.667±7.637 [19];
- **whole oat flour** standardized, purchased from SC Cope SA Piatra Neamt, having the following features: pH 6.320±0.020, moisture (%) 10.263±0.032, ash content (%) 1.420±0.050, protein content (%) 11.000±0.125, fibres content (%) 4, carbohydrates content (%) 66, lipid content (%) 8, falling number 733.000±6.083, granulation characterized by an average particle size of less than 500 μ for 97% of the particles, the remaining 3% having dimensions between 500 and 1,000 μm;
- **whole barley flour** from the stone mill (according to the producer, Solaris Plant S.R.L.), having the following features: pH 5.513±0.023, moisture (%) 10.200±0.020, ash content (%) 1.000±0.025, protein content (%) 10.700±0.100, falling number 388.667±5.131) [19];
- **whole millet flour** from the stone mill (according to the producer, Solaris Plant S.R.L.), having the following features: pH 6.483±0.021, moisture (%) 10.250±0.026, ash content (%) 0.643±0.045, protein content (%) 10.500±0.135, falling number 326.667±5.773) [19].

The percentages of the flours mixtures (the tested variants) for dough preparation, as well as the performed analyzes are outlined in Table 1.

The tests were performed in trplicates (n=3), taking into account as representative, the mean values of replicates, after statistical evaluation.

Table 1. Experimental plan

No. of variant	Wheat flour (%)	Oat flour (%)	Barley flour (%)	Millet flour (%)
Control	**100**	0	0	0
1	85	15	0	0
2	70	30	0	0
3	85	0	15	0
4	70	0	30	0
5	85	0	0	15
6	70	0	0	30
Performed analyses				
Dough (obtained by the method of performing the baking test): pH after kneading, pH after fermentation, temperature after kneading, temperature after fermentation, technological water absorption **Bread** (2 hours after being removed from the oven): pH, moisture, volume, porosity.				

In order to obtain the finished bakery products, bread respectively, were followed the recipes and methodology presented in Table 2.

The analyzes were performed using the methods described below.

Moisture determination. Moisture M% was determined on crumb samples, from the center of bread, using the thermobalance Precisa XM 60.

pH determination. pH was determined using Serna-Saldivar method (2012), as follows: extraction of 10 g bread sample in 100 ml of distilled water for ½ hour [15]. Measurement was performed with a pH-meter Testo 206 pH1, after filtering the extract. Determination of dough pH was done directly in dough, using a Testo 206 penetration probe pH meter.

Table 2. The recipes and technological process used for baking tests

No. of variant	Wheat flour (g)	Oat flour (g)	Barley flour (g)	Millet flour (g)
Control	1,500	0	0	0
1	1,275	225	0	0
2	1,050	450	0	0
3	1,275	0	225	0
4	1,050	0	450	0
5	1,275	0	0	225
6	1,050	0	0	450
Recipe and technology				
Recipe: **37.5 g** dry yeast Pakmaya **22.5 g salt** **water** - variable, depending on technological water absorption%, in order to obtain a dough of normal consistency **4.5 g baking conditioner** - Pan Up T-Max (Orkla manufacturer; ingredients: wheat flour, antioxidant E300; enzymes - xylanase, lipase, amylase, oxidase, cellulase; dextrose). **Technology:** **kneading**: 12 minutes on a single-speed mixer (100 rpm) with fork stirring arm; **dough resting**: 10 min; **partition**, 355-365 g; **round modeling**; **rest**: 5 min; **long modeling**; **fermentation** under controlled conditions: 45 min at 37^0C, 78% humidity; **baking**: 220^0 C for 20 minutes				

The bread mass was determined by weighing it to a technical balance (the determination of the weight of the bread is necessary to calculate the porosity).

Determination of crumb porosity was performed using the weighing method, described by STAS 91/1983. The method is based on the relationship between weight and volume of the sample [20].

Determination of bread volume was performed by gravimetric method described by STAS 91/1983, using rape seeds of known volumetric density, in order to determine the volume of bread displaced there from. The density used to determine the bread volume was 0.676 g/cm^3.

Interpretation and results processing techniques. Interpretation of results was performed using computer-assisted statistical analysis techniques. Microsoft Excel program have been used to run graphics, media and dispersion calculations. The significance of mean differences t test was performed using the QuickCalcs online software from GraphPad, Software, based on the probability of transgression: *significant $p<0.05$; **very significant $p<0.01$ and ***extremely significant $p<0.001$ [7, 18, 25].

RESULTS AND DISCUSSIONS

a. Technological parameters of dough

The baking tests were performed and the technological parameters were measured during the respective technological phases. The technological parameters of dough, prepared from wheat flour and mixtures of wheat, oat, barley and millet flours are presented in Table 3 (n = 3).

Dough technological water absorption. The dough technological water absorption varied significantly, depending on the flour used. Generally, the flours enriched in fibers (oat, barley) led to an increase of dough water absorption, relative to control flour.

The increase was insignificant for variants that involved the addition of 15% of β-glucans rich flours, to control flour (t=2.343 for oat and t=0 for barley flour). The addition of larger amounts, had significant growth effects on the technological water absorption.

Thus, in the case of 30% whole oat flour addition, the technological water absorption increased very significant, with 3.333 ml/100 g of dough (t=5.574**).

In the case of 30% barley flour addition, the water absorption increased extremely significant, with 6.667 ml/100 g of dough, (t=9.17***).

In the case of 30% barley flour addition, the water absorption increased extremely significant, with 6.667 ml/100 g of dough, (t=9.17***). In the case of millet flour, the addition of a smaller amount (15%), resulted in a very significant decrease of the water

absorption (-2.333 ml/100 g, t=5.293**). The addition of 30% millet flour resulted in a very significant increase of dough water absorption, compared to the 15% variant (+ 2.9 ml/100 g, t=5.705**), to a level corresponding to that of the control (60.567, t=1.18 ns).

Table 3. Technological parameters of dough

Parameter/ Flour assortment	Technological water absorption WA (%)	Dough temperature (^{0}C)	Dough pH	Dough temperature (^{0}C)	Dough pH
		after kneading		after fermentation	
Wheat	60.000±0.500	21.400±0.529	6.030±0.010	27.767±0.252	5.57±0.01
Wheat-Oat (85:15)	61.033±0.577	23.400±0.200	5.870±0.010	27.800±0.200	5.56±0.005
Wheat-Oat (70:30)	63.333±0.907	22.400±0.529	5.980±0.020	28.333±0.503	5.57±0.01
Wheat- Barley (85:15)	60.000±0.500	25.100±0.854	5.720±0.010	29.877±0.759	5.37±0.006
Wheat- Barley (70:30)	66.667±1.155	26.500±0.500	5.600±0.050	27.267±0.305	5.36±0.006
Wheat-Millet (85:15)	57.667±0.577	26.600±0.360	5.723±0.025	29.067±0.513	5.49±0.006
Wheat-Millet (70:30)	60.567±0.665	27.467±0.450	5.673±0.011	30.100±0.361	5.48±0.006

Dough temperature after kneading and fermentation. The dough temperature after the kneading phase, naturally depended on the temperature of the added ingredients, especially the temperature of the water used. The dough temperature after kneading increased significantly from 21.40° C for the control samples to 26-27° C for the wheat-millet flour samples (extremely significant variation t=14.07*** for 15% and t=15.13*** for 30%).

The dough temperature after fermentation increased extremely significant from 27° C in the control samples to 30° C in the case of 30% millet flour (t=9.17***).

Dough pH after kneading and fermentation. The dough pH after kneading, fell significant from oat, to barley and millet, regardless of the variant (t ranged from 3.87* for 30% oat, up to 41.59*** on addition of 30% millet).

The effects of fermentation and the accumulation of lactic acid in dough, were visible in the pH decrease at the end of the fermentation, as compared to the end of the kneading phase. The highest decrease in pH was observed in control samples (-0.46), followed by mixtures with oat flour (-0.31 for the 15% variant and -0.41 for the 30% variant), barley flour (-0.35 and -0.24, respectively) and millet flour (-0.23 and -0.19, respectively). The lowest dough pH values at the end of fermentation, were observed in the case of barley flour (5.36-5.37) and millet flour addition (5.49).

Practically, the dough prepared from flours mixtures with barley and millet, had after fermentation an extremely significant lower pH value, compared to the control (from t=30.74***, 30% barley to t=11.88***, 15 % millet).

Table 4 shows the Spearman correlations coefficients between the temperature after kneading, the temperature after fermentation and the pH of dough obtained from all the analyzed flours, namely wheat flour and six mixtures of flours (n=7).

Interestingly, no significant correlations (r=0.536; p=0.215 ns) were observed between the temperature after kneading and the temperature after fermentation. Since all samples were fermented under identical conditions (37 ° C, 78% relative humidity for 45 minutes) and the initial temperatures varied significantly from one sample to another, the lack of a significant correlation between the two temperatures could be an argument for the existence of different thermal conductivity of the dough, depending on the quantities and nature of the ingredients used.

This is a hypothesis to be tested in another experiment.

Table 4. The Spearman correlation coefficients between the technological parameters of dough

Parameter		Flours pH	Temperature after kneading	Temperature after fermentation	pH after kneading	pH after fermentation
Flours pH	r	1.000				
	p	-				
Temperature after kneading	r	-0.571	1.000			
	p	0.180	-			
Temperature after fermentation	r	-0.143	0.536	1.000		
	p	0.760	0.215	-		
pH after kneading	r	0.571	**-0.821***	-0.214	1.000	
	p	0.180	**0.023**	0.645	-	
pH after fermentation	r	0.595	-0.703	-0.144	**0.955*****	1.000
	P	0.159	0.078	0.758	**0.001**	-

r - correlation coefficient; p - the probability

Table 4 shows that the dough temperature after kneading, significantly influenced the pH parameter, determined at the end of the phase. Thus, in warmer dough, acidification of pH (r= - 0.821*) was observed. There were no significant correlations between the analyzed parameters and the dough temperature at the end of the fermentation stage.

It was noted that the dough pH after kneading was not dependent on the initial pH value of the flour mixtures (r=0.571). Also, dough pH value after fermentation increased extremely significant, as pH value after kneading was higher (r=0.955***).

b. Quality parameters of finished bakery products

The main quality characteristics of bread obtained from the control flour and the flours mixtures, after the baking tests, are shown in Table 5 (n=3).

Table 5. Quality parameters of bread made from wheat flour and mixtures of flours

Parameter/ Flour assortment	Wheat	Wheat-oat		Wheat-barley		Wheat-Millet	
	100	**85:15**	**70:30**	**85:15**	**70:30**	**85:15**	**70:30**
Moisture (%)	44.863 ± 0.158	44.613 ± 0.180	45.110 ± 0.100	45.033 ± 0.950	45.600 ± 0.100	42.630 ± 0.402	43.160 ± 0.153
pH	6.220 ± 0.020	6.120 ± 0.010	6.120 ± 0.072	5.993 ± 0.025	5.950 ± 0.010	6.000 ± 0.100	5.923 ± 0.025
Volume (cm^3/g)	4.686 ± 0.080	4.140 ± 0.075	3.663 ± 0.165	3.820 ± 0.140	3.710 ± 0.210	4.010 ± 0.150	4.377 ± 0.040
Porosity (%)	79.050 ± 1.767	77.792 ± 3.321	75.493 ± 1.413	80.907 ± 0.907	77.933 ± 0.777	80.937 ± 0.645	82.907 ± 0.676

Moisture of finished products. The moisture content of wheat flour bread was not significantly different from that of wheat-oat bread, regardless of the variant (t=1,808 for 15% variant and t=2,280 for 30% variant). The moisture increase was also insignificant for the variant with 15% whole barley flour (t=0.305). In the case of bread with 30% whole barley flour, moisture increased very significant, compared the control, from 44.86% to 45.6% (t=6.827**). The millet flour bread had extremely significant lower moisture than the control sample: 42.63% on 15% millet flour bread (t=8.954***), respectively 43.16% on 30% millet flour bread (t=13 414***). The increase in whole flours content resulted in a significant increase in bread moisture, between the two variants with whole oat flour (15% vs. 30%), from 44.61% to 45.11% (t=4.180*). There were no significant bread moisture differences between the two variants (15% vs. 30%) of barley or millet flours addition.

pH of finished products. All products made from mixtures of wheat flour with whole cereals flours, had a significantly lower pH than the control sample (wheat bread). The pH decrease was very significant in the 30% millet flour sample (5.923; t=16.068***).

The closest pH to that of control sample was observed in the case of loaves with whole oat addition (6.12; t=7.746**), although the differences were however very significant.

Barley addition bread had a pH of 5.95 (variant 30%, t=20.914***) and 5.993 (variant with 15%, t=20.914***), being extremely significant lower than the control. The increase of whole flours addition in the flour mixtures, did not result in significant changes in bread pH, between the tested variants (15% vs. 30%), no matter the cereal assortment used (t=0-2,77 ns).

Volume of bread. It can be seen that the volume of whole flours loaves decreased significantly compared to the bread made from wheat flour.

The highest volume decrease was observed in whole barley loaves (-0, 87 ml/g at 15%, t=9.302*** extremely significant, and -0.98 ml/g at 30%, t=7.522** very significant) and whole oat loaves (extremely significant in both variants: -0.55 ml/g for 15% variant t=8.624*** and -1.02 ml/g for 30% variant, t=9.663***).

The millet flour bread samples had the closest volumes to bread made from wheat flour, however the differences were very significant. Thus, the decrease was -0.68 ml/g for the variant with 15% millet flour (t=6.887**) and -0.31 ml/g for the variant with 30% millet flour (t=5.984**).

At the same time, the increase of the whole flours amount in bread, resulted in a significant decrease of bread volume between variants. For example, in wheat-oat flour bread, 15% vs. 30%, the volume decreased significantly with -0.48 ml/g, t=4.558*.

In barley flour bread, no significant different volumes were recorded, between the variants (15% vs. 30% decrease of -0.11 ml/g, t=0.755 ns). In the case of millet flour bread volume, the 30% variant was even significant higher than the 15% variant (+0.37 ml/g; t=4.094*), unlike the whole oat and barley loafes.

Porosity of bread. Although decreases in whole oat and barley bread porosity were observed, compared to the porosity of the control sample, these decreases were not statistically significant (t=0.579-2.723).

The only significant difference, from the porosity of the control sample, was observed in the case of 30% whole millet flour bread (+3.86%, t=3.531*).

No significant porosity differences were found between variants, in whole oat bread (15% vs. 30%, t=-1.129 ns).

On the other hand, in the case of barley loafes, the difference between the porosity of the two variants was significant, in the sense of its value decreased, as the total barley flour increased (t=-4.313*).

In millet flour bread, a significant increase of porosity was recorded in 30% variant, versus 15% variant (t=+3,650*).

The overall appearance of finished products, as well as sectional layouts are shown in Fig. 1 and Fig.2.

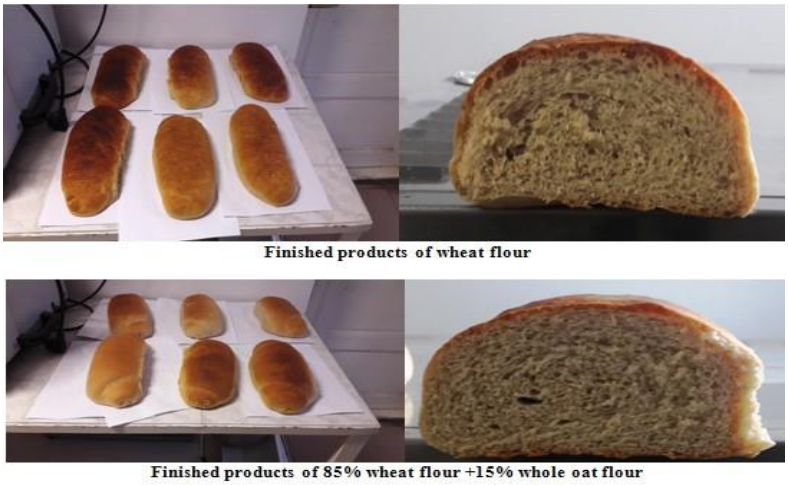

Fig. 1. General appearance and sectional layouts of loaves made of wheat flour and mixture of wheat and 15% oat flour

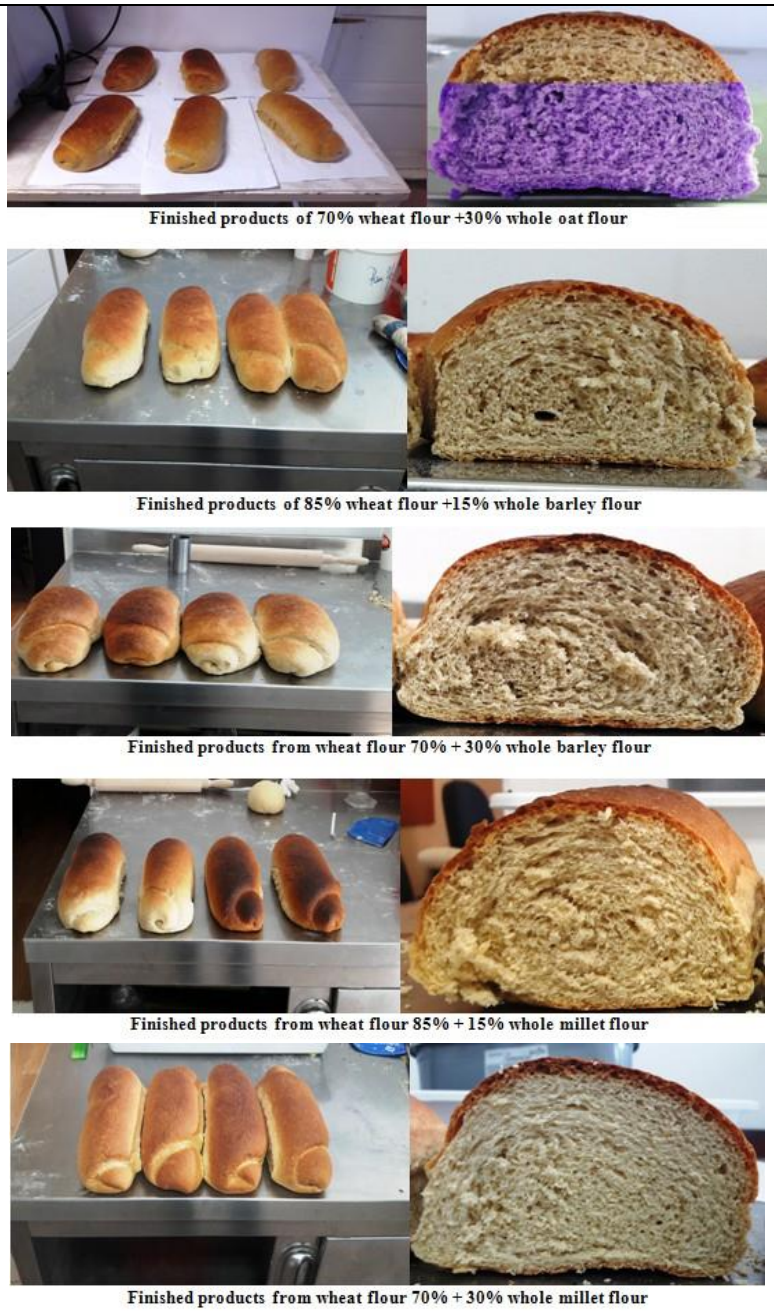

Fig. 2. General appearance and sectional layouts of loaves made of wheat flour mixtures with oat, barley and millet flours, in different proportions

Table 6 presents the main nonparametric correlations (Spearman) between the bread quality parameters, physical-chemical and technological parameters of dough (n=7).

From Table 6 we can see that the **moisture of the bread** was even higher, as the water absorption of the flour from which it came, was higher, without reaching the significance limit (r=0.703). This may be an indicator that flours with a higher water retention capacity, due to their higher fibers content, transfer to some extent this feature to finished products.

The **bread volume** did not significantly correlate with any technological parameters, however, it was most strongly influenced by the flours pH (t=0.643) and the bread moisture (t=-0.643).

As expected, the bread pH was extremely significant correlated with the dough pH, at the end of the kneading operation (r=0.955***) and significant after the fermentation (r=0.864*).

Table 6. Spearman correlations between bread quality parameters and technological parameters of flours and dough

Specificații		WA (%)	T^0 after kneading (^{0}C)	Flours pH	pH after kneading	T^0 after fermentation (^{0}C)	pH after fermentation	Bread moisture (%)	Bread volume (cm^3/g)	Bread pH	Bread porosity (%)
Bread moisture (%))	**r**	0.703	-0.429	-0.071	-0.107	-0.536	-0.180	1.000	-0.643	0.018	-0.643
	p	0.078	0.337	0.879	0.819	0.215	0.699	.	0.119	0.969	0.119
Bread volume (cm^3/g)	**r**	-0.505	0.000	0.643	0.250	0.107	0.252	-0.643	1.000	0.180	0.500
	p	0.248	1.000	0.119	0.589	0.819	0.585	0.119	.	0.699	0.253
Bread pH	**r**	-0.164	**-0.883****	0.505	**0.955*****	-0.450	**0.864***	0.018	0.180	1.000	-0.559
	p	0.726	**0.008**	0.248	**0.001**	0.310	**0.012**	0.969	0.699	.	0.192
Bread porosity (%)	**r**	-0.667	0.714	-0.214	-0.429	0.643	-0.414	-0.643	0.500	-0.559	1.000
	p	0.102	0.071	0.645	0.337	0.119	0.355	0.119	0.253	0.192	.

The initial pH of flours mixtures did not contribute significant to the final pH of the bread (r=0.505). Of the technological parameters, the greatest influence on the bread pH had the dough temperature at the end of the kneading phase. The higher the dough temperature at the end of the kneading phase, the lower was the bread pH, establishing a very significant negative correlation (r=-0.883**).

The porosity of the bread crumb did not established significant correlations with the other parameters, however it is disadvantaged by the increase of the water absorption of the flours from which bread was prepared (t=-0.667). The possible explanation is an indirect effect of the increase of fibers content in the flours, as the water absorption increased. Basically, the lower porosity of the bread was due to the mechanical destabilization of the gluten films in dough, because they are involved in gases retention and formation of the crumb structure. The increase in porosity was favored by the increase in temperature after kneading (t=0.714), due to increased activity of yeast and higher gases release.

CONCLUSIONS

It was recorded a significant increase of technological water absorption in dough from fibers-rich flours (with 30% oat and barley), compared to the control ($p<0.05$). Millet flour, less fibers-rich, reduced the water absorption of wheat flour at 15% addition, not modifying it at 30% addition. Dough temperatures after kneading have progressively increased from 15% to 30% of whole cereals addition. The highest increases in the dough fermentation temperature were recorded in the case of millet flour addition. The kneading and fermentation operations resulted in significant pH decreases, due to the effect of the accumulation of lactic acid in dough. After kneading the dough pH dropped in order, to oat, barley and millet mixtures. The pH after fermentation decreased even more drastically, compared to the control and to the pH measured after kneading.

The Spearman correlations, performed on the 7 assortments of investigated flours, indicated that the temperatures after kneading and fermentation did not correlate with each other, as we would have expected. It had been observed that the temperature after kneading, significantly decreased the dough pH after kneading ($p<0.05$). An extremely significant positive correlation had been established between dough pH after kneading and dough pH after maturation ($p<0.001$). The addition of β-glucan rich whole flours (30% barley) significantly increased the moisture content of finished products, due to the fibers ability to absorb important amounts of water ($p<0.05$). The moisture content of the finished products decreased significantly on the addition of millet flour, regardless of the variant ($p<0.05$). The technological water absorption of the flours influenced the moisture content by 49% ($r^2=0.49$). The finished products with whole flours additions (oat, barley, millet) were more acidic than wheat bread. Extremely significant decreases were observed in bread with barley flour (15% and 30%) addition and in bread with millet flour (30%) addition ($p<0.001$).

Significant decreases in the volume of bread were observed in oat and barley variants, especially in 30% additions ($p<0.05$), but also with the addition of millet flour. Existing fibers in these flours caused damages to gluten films that retain fermentation gases, and therefore the volume of retained gases was lower.

The porosities of the finished products were similar, statistically speaking, excepting the bread with millet flour 30%, which showed a significantly increased porosity ($p<0.05$), compared to the control bread, prepared exclusively from wheat flour. Porosity varied between bread variants with 15% or 30% barley, being significant lower, as barley flour was added.

Correlations between dough technological parameters and bread quality parameters showed that bread pH correlated positive extremely significant with dough pH after kneading ($p<0.001$) and only significant with dough pH after fermentation ($p<0.05$). It was found that the higher the dough temperature after kneading was, the lower bread pH was, establishing a very significant negative correlation ($p<0.01$).

The volume of bread was not significantly correlated with any other parameter, but the parameters that most influenced the pH were the pH of the flours ($r^2=0.41$) and the bread moisture ($r^2=0.41$).

The increase of the flours water absorption influenced the decreased of the bred porosity value by 44% ($r^2=0.44$). The increase in bread porosity was also determined by the increase of the temperature after kneading, by almost 51%, as the fermentation gases were released.

In terms of consumers purchase criteria for the bread acquisition (volume, porosity), rich fibers products (up to 30%) had almost a similar appearance like wheat bread. The addition of fibers, as well as the high content of vitamins, proteins and minerals, from barley, oat, millet, is a major gain for health, as this type of bakery products are functional products.

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CONCENTRATION OF APPLE PRODUCTION IN ROMANIA IN THE PERIOD 2007-2016

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Abstract

The paper aimed to analyze the concentration degree of apple production in Romania based on the empirical data provided by the National Institute of Statistics for the period 2007-2016, and Herfindhal-Hirschman (HHI) and Gini-Struck (GS) indices. The surface of apple tree orchards was 57.5 thousand ha in 2014, by 6.2 % less than in 2007, and in 2016, the number of apple trees accounted for 24.7 million, representing 79 % of the number if trees existing in the first year of the analysis. Also, the apple production declined by 1.8 % from 475.4 thousand tons in 2007 to 467.3 thousand tons in 2016. The only positive aspect is that apple yield increased by 20 % from 7.75 tons/ha in 2007 to 9.3 tones/ha in 2016. The HHI ranged between 0.1926 in 2007 and 0.1910 in 2015 and the GSI varied between 0.2779 in 2007 and 0.2747 in 2016, reflecting a moderate concentration degree of apple production in Romania, meaning that between the eight micro-regions of development there are a few differences of performance. Despite that Romania comes on the 3rd position regarding the apple orchards surface, it is placed on the 8th position among the most important apple producers in the EU. In order to increase apple production and yield, it is needed as the Romanian apple producers to create new intensive plantations based on investments in modern technologies and technical endowment which assure the economic efficiency in apple tree growing.

Key words**:** *concentration degree, apple production, Romania*

INTRODUCTION

Apple tree belongs to *Rosaceae* family, *Pomoideae* subfamily and *Malus Genus* [15].
At present, there are more than 10,000 varieties of apple trees and the chemical content and qualities of apples make them to be on the second position after bananas among the most produced and consumed fruits in the world [2].
The world apple production accounts for about 69 million metric tons/year and continues to increase despite the competition with the tropical and exotic fruits.
Apples have a rich chemical composition in water (75-95 %), minerals, acids, amino-acids, A and C vitamins, phenols, Potassium, soluble fiber pectin etc. which indicates their quality and consumer's health status. The nutritive values of apples is conditioned by a large range of factors among the most important ones being: apple tree variety, certification of the planting material, soil type, climate conditions, production area, technologies applied, storage and selling conditions [4].
Besides their nutritive value, organoleptic and therapeutic features, pleasant taste, flavor, smell, sweetness and acidity, apples could be preserved fresh for a long period time, and are resistant to transportation and storage. The apple trees could be grown in various soil and climate conditions and technological systems and could achieve a high production performance a reason for which they are cultivated in almost all the regions of Romania [12].
Apples represent 3% of the overall consumer basket in the EU, besides other foods. The area with apple tree plantations in Romania represents 11% of the total EU orchards surface (450,000 ha).
Romania has a long tradition in fruit tree growing which has an important role in agriculture. Apple and plum trees are by far on the top from the point of view of surface and production [9].
The most important varieties grown in Romania are Jonathan, Golden Delicious, Red Delicious, Idared, Starkrimson, Jonagold,

Prima, Florina, Topaz, Romus 3, Romus 4, Generos de Voinesti, Frumos de Voineti, and Gala [1, 18].

The favorable geographical conditions aloows Romania to cultivate both summre, autumn and winter apple tree varies.

The Romanian apple varieties are more tasty and flavored than the ones produced in Turkey, Italy and Poland.

The Romanian Jonathan apples are by 20 % sweeter than the Polish apples, the Romanian Gokden Delicious is by 22 % sweeter than the Italian Golden and by 14 % sweeter than the Turkish Golden.

Also, the Romanian Jonathan contains by 25 % more minerals and is by 80 % rich in vitamins than the Jonathan produced in Poland.

The Romanian varieties: Frumos de Voinesti, Delicious de Voinesti, Radasani, Voinea, Ardelean and Jonathan are the sweetest apple varieties cultiveted in the country. Jonathan is the most cultivated variety with the highest share in apple production.

In Romania, apple production has a slight trend to decline, but apple yield continues to increase as a compensation in the reduction of orchards surface [3].

In this context, the objective of the paper was to analyze the dynamics of apple production, orchards surface, number of apple trees and their dispersion in the territory. More than this, it was aimed to assess the concentration degree of apple production in the last ten years, more exactly in the period 2007-2016 in order to establish if apple is suitable to be cultivated at a large scale in Romania in order to cover better the consumption and balance the offer/demand ratio.

MATERIALS AND METHODS

In order to analyze the concentration degree of apple production in Romania, the empirical data for the period 2007-2016 were collected from the National institute of Statistics, Tempo-online Data Base, regarding the following indicators: the surface covered by apple orchards, the number of apple trees, apple production, apple yield, both at the country level and by the eight micro-regions of development: North West, Center, North East, South East, South Muntenia, Bucharest-Ilfov, South West Oltenia and West.

Herfindhal-Hirschman Index (HHI), characterizing the concentration degree, was calculated using the formula:

$$HHI = \sum_{i=1}^{n} g_i^2 \quad (1)$$

and the interpretation of the results was the following one: HHI < 0.01 reflects a high uniformity among regions, HHI < 0.15 reflects a lack of concentration, HHI < 0.25 reflects a moderate concentration degree, HHI > 0.25 reflects a relative high concentration and HHI > 0.5 indicates a high concentration degree [13].

Gini-Struck Index (GSI) was also used to evaluate the concentration degree or dispersion of apple production in the territory by micro-region, being determined using the formula:

$$GSI = \sqrt{\frac{n\sum_{i=1}^{n} g_i^2 - 1}{n-1}} \quad (2)$$

The interpretation of the results was the following one: the dispersion of values is relatively equal among micro-regions of development, when the GS value is close to zero, reflecting concentration of apple production. When the GS value is close to 1, there are high differences among micro-regions, therefore there is no concentration of apple production. When the GS value > 0.5, it is about a high concentration. When, the GS value > 0.3, it is a relative concentration of production [11, 14, 17].

The obtained results have been tabled and graphically illustrated and correspondingly interpreted.

RESULTS AND DISCUSSIONS

The surface of apple tree orchards. Despite that apples contributes by about 33 % to fruit production in Romania, the surface of apple tree plantations has registered a continuous decline in the analyzed period**,** so that in 2014, it accounted for 57.5 thousand ha, by 6.2 % less than in the year 2007, when there were 61.3

thousand ha cultivated with apple trees (Fig.1.).

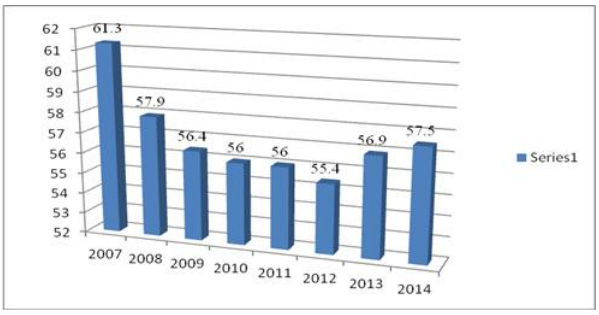

Fig.1.The dynamics of apple orchards surface in Romania, 2007-2014 (Thousand ha)
Source: Own design based on National Institute of Statistics, Tempo-Online, 2017 [16]

Taking into account the surface of apple tree orchards, Romania comes on the 3rd position in the EU-28 after Poland and Italy. In 2012, of about 450,000 ha apple orchards in the EU-28, Poland has 143 thousand ha 931.8%), Italy 52 thousand ha (11.6%), Romania 51 thousand ha (11.4%), being followed by France with 35 thousand ha (8.2 %), Germany with 31 thousand ha (7.1 %), Spain (6%) and Hungary (5.6 %). All these six major producers own 80 % of the EU-28 apple tree orchards surface [5].
The number of apple trees has also registered a decrease. If in 2007, Romania had 31.3 apple trees in productive plantations, in the year 2016, it had only 24.7 million trees, representing 79.07 % of the level recorded in the first year of the analysis. However, the number of apple trees represent about 32-33 % of the fruit trees and it is in a strong competition with the number of plum trees (Fig.2).
The decline of the surface covered by apple plantations and of the number of apple trees was caused by the fact that about 60 % of the 58 thousand ha of apple orchards are older than 20-25 years, and only about 8,000-10,000 ha have new plantations where the modern intensive technologies are applied.
The few investments in apple tree plantations, in fruit tree growing in general, are justified by the small size of the farms, just a few of them having 10-20 ha, the lack of financial resources of the farmers, the high investment cost to assure a corresponding density of 3,500 trees/ha in intensive plantations, the nonsufficient certified planting material, the high cost of maintenance, irrigation, pest control and disease treatments, anti-hail nets, trellises, and sustaining hires etc.

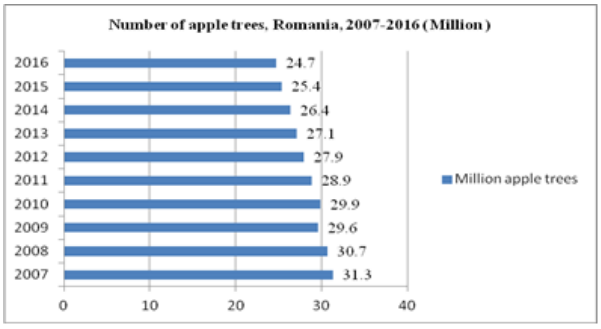

Fig.2.The dynamics of apple trees in Romania, 2007-2014 (Million trees)
Source: Own design based on National Institute of Statistics, Tempo-Online, 2017 [16]

Photo 1. An intensive apple plantation.

For example, for a super-intensive plantation, the total investment cost is about Euro 25,000-30,000 /ha, the maintenance cost per year could reach Euro 6,000/ha. At a production varying between 30-60 tons apples/ha, and a selling price of Euro 500/ton, this means that a producer could get between Euro 15,000 and 30,000 per ha in favorable climate conditions of temperature and rainfalls [10].
In Romania, tree growing is carried at present in small farms of about 0.3-2 ha/owner compared to farms of 200-300 ha which existed before 1989. In this small farms, lacked of technical endowment and financial resources, the rhythm of regeneration is very slow. The number of farms of 10-20 ha is too small to be important, most of the tree growing systems being extensive, where the tree density

varies between 800-1,200 trees per surface unit [8].

The lack of certified planting material is also an important cause of the low production. Compared to an annual requirement, in Romania are produced about 2.3 million trees of which only 500,000 are certified.

The M9 port grafting largely used in the apple orchards in the Western European countries does not exist in the Romanian plantations. It is important to adapt the port grafting to increase production performance [20].

The distribution of apple trees by micro-region of development is different from a region to another, taking into account the soil and climate conditions, the apple tree mapping in Romania.

The most important areas where apple tree has favorable conditions are the Sub-Carpathians hilly and slopes areas including the Arges, Valcea, Dambovita and Prahova counties. Also, the North West area is suitable for apple tree growing including the Maramures, Salaj, Cluj, Satu Mare and Bihor counties. The Central part of Romania is also an important area for apple tree cultivation in the following counties: Bistrita Nasaud, Mures, Sibiu, Harghita, Brasov, Hunedoara and Alba. The North Eastern part of Romania, including the Botosani, Iasi, Bacau, Vaslui, Vrancea and Buzau counties is also commonly used for apple tree growing. The South West Oltenia including the Gorj, Olt and Mehedinti counties is suitable for apple tree plantations. Even in the South Muntenia in Giurgiu, Calarasi and Ilfov, apple trees are cultivated. In general, the most favorable zones are situated in the hilly areas, where the annual rainfalls could reach 700-800 mm and the temperatures are correspond to the species and variety requirements, with large variations between day and night in the autumn to assure a specific flavor to the Romanian apples [19].

Table 1. The dispersion of the number of apple trees by micro-region, Romania, 20017-2016 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NW	33.4	32.1	30.7	26.2	25.8	26.6	26.2	27.1	28.3	28.1
C	15.3	15.6	14.5	15.3	18.2	18.3	17.9	17.3	16.3	15.8
NE	15.6	17.2	17.8	15.6	17.8	17.5	17.1	18.0	17.3	17.0
SE	6.0	6.1	6.1	6.5	6.6	7.5	7.3	6.9	6.9	7.9
S Munt.	15.8	15.5	16.6	15.7	15.9	13.6	14.1	14.0	14.7	14.9
Buc. If.	0.1	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2
SW Olt.	6.6	6.8	7.9	8.2	8.0	8.4	8.8	8.4	8.6	8.7
W	7.2	6.5	6.2	12.3	7.7	7.9	8.4	8.1	7.7	7.4

Source: Own calculation based on National Institute of Statistics, Tempo-Online, 2017 [16]

In the year 2016, the number of apple trees accounted for 6.9 million in the North West area (28.1 %), 4.2 million in the North Eastern part 9 17%), 3.9 million in the Central part (15.8 %), 3.7 million in the South Muntenia (14.9 %), 2.2 million in the South West Oltenia (8.7 %), 1.9 million in the South Eastern part (7.9 %), 1.8 million in the Western part and just 0.06 million in Bucharest-Ilfov area (0.2 %).(Table 1).

The concentration degree of the number of apple trees. In terms of Herfindhal-Hirschman Index, the evolution of the values during the 10 years of analysis, 2007-2016, reflected a moderate concentration degree, meaning that there are a few discrepancies among micro-regions regarding the number of tree apples. The HHI values varies between 0.20141 in the year 2007, the highest value, 0.1671 in the year 2010, the lowest value, and 0.1743 in the year 2016.

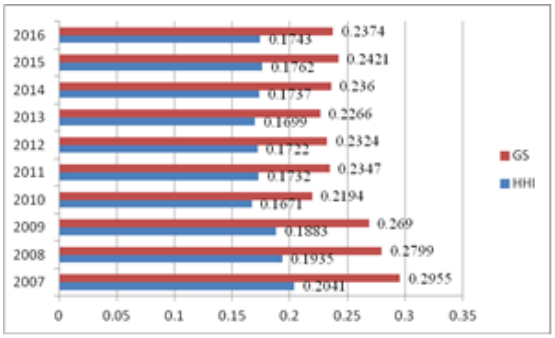

Fig.3.The dynamics of the concentration degree for the number of apple trees in terms of HHI and GS, Romania, 2007-2016
Source: Own design based on National Institute of Statistics, Tempo-Online, 2017 [16]

The Gini-Struck Index also registered low values, ranging between GS= 0.2955, the highest value registered in 2007, and GS= 0.2194 recorded in the year 2010, and GS= 0.2374 in 2016 (Fig.3).

Photo 2.A super-intensive apple plantation

The apple production has registered a decline from 475.4 thousand tons in the year 2007 to 467.3 tons in 2016, meaning a reduction of 1.8 %. The highest production of apples was 620.4 thousand tons, recorded in the year 2011.

The variation of apple production was determined by many factors: climate change, mainly by the strong droughts in the years 2012, 2015 and 2016, and other extreme meteo phenomena such as: hail falls and frost at blooming and fruit formation, the lack of irrigation systems and of protection nets against hail, the lack of certified biological material resistant to diseases and pests (Fig.4.).

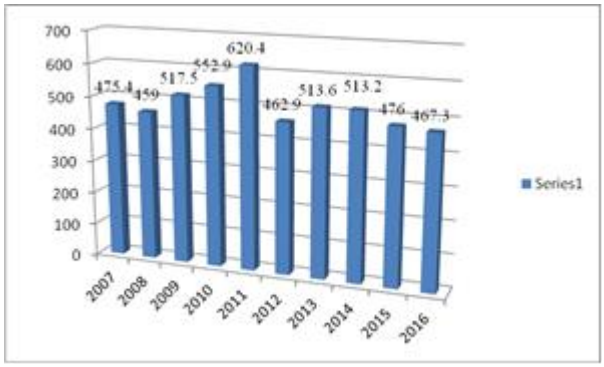

Fig.4. The dynamics of apple production, Romania, 2007-2016 (Thousand tons)

Source: Own design based on National Institute of Statistics, Tempo-Online, 2017 [16]

Apples come on the 1st position among fruit production, being in competition with plums, mainly desired for processing in plum brandy. However, the contribution of apples to fruit production has declined from 43.7 % in the year 2007 to 37.6 % in the year 2016 (Fig.5.).

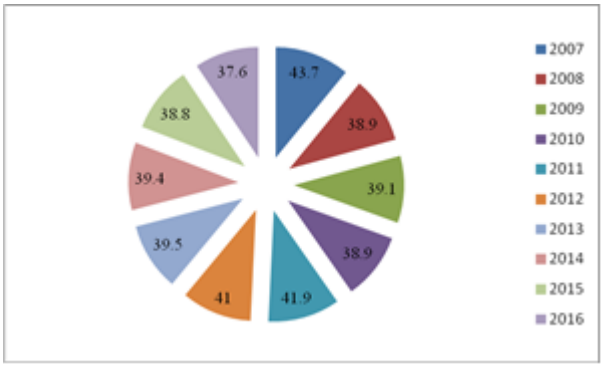

Fig.5. The share of apple production in fruit production of Romania, 2007-2016 (%)

Source: Own design based on National Institute of Statistics, Tempo-Online, 2017 [16]

At the EU level it was registered a decline of apple production mainly in Poland, Romania, Hungary in the period 2007-2013, but also in Spain and France where the decrease started since 2002. Apples are on the top position among other fruits in the EU, being followed by oranges.

In 2015, as an apple producer, Romania came on the 8th position with 0.4 million tins after Poland (32 million tons), Italy (24.5 million tons), France (19.5 million tons), Germany (9.5 million tons), Spain (0.6 million tons), Hungary (0.5 million tons) and United Kingdom (0.45 million tons) [6].

At the world level, Romania comes on the 26th position as an apple producer with 462 thousand tons apples, the main apple producers in the world being: China (47 million tons), USA (4.1 million tons), Turkey (2.9 million tons), Poland (2.8 million tons), India (2.2 million tons), Italy (1.99 million tons), Brazil (1.8 million tons), Chile 91.6 million tons), Russia (1.4 million tons) and France (1.38 million tons) [7].

The dispersion of apple production by micro-region. In the year 2007, the main apple producing micro-regions, in the decreasing order, were: South Muntenia with 158.1 thousand tons (33.2%), North East with 79.2 thousand tons (16.6%), North West with 74.9

thousand tons (15.8%), the Center with 46.2 thousand tons (9.8 %), South West Oltenia with 42.6 thousand tons (8.9 %), West with 41.1 thousand tons (8.7 %) and South East with 32.8 thousand tons (6.9 %).

In the year 2016, on the 1st position came the North West region with 125.6 thousand tons (26.9%), followed by South Muntenia with 116.8 thousand tons (25%0, North East with 75.6 thousand tons (16.2%), the Center with 53.9 thousand tons (11.5%), South West Oltenia with 44.6 thousand tons (9.6%), South East with 33.1 thousand tons (7.1%) and West with 16.6 thousand tons (3.5%).

Taking into account the whole apple production achieved in the period 2007-2016, the decreasing order of the micro-regions is the following one: NW, S Muntenia, NE, C, SW Oltenia, SE, W and Bucharest-Ilfov (Table 2).

Table 2. The dynamics of apple production by micro-region, Romania, 2007-2016 (Thousand tons)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Cumulated 2007-2016	Position
NV	74.9	94.2	119.6	98.3	155.8	110	139.7	151.8	137.1	125.6	1,207	1
C	46.2	107.4	85.3	87.4	69	51.2	59.1	71.3	59.3	53.9	690.1	4
NE	79.2	87.5	106.5	89.4	106.5	84.3	79.9	91.5	83.8	75.6	884.2	3
SE	32.8	30.3	26.2	41.3	46.5	30.6	33.9	36.9	34.1	33.1	345.7	6
S Munt.	158.1	84.5	107.8	143.4	138.5	117.5	121.7	105.3	105.5	116.8	1,199.4	2
Buc. Ilf.	0.5	1.1	1.1	0.8	0.6	0.7	0.9	0.8	0.9	1.1	8.6	8
SW Olt.	42.6	30.7	45.6	55.9	65.5	42.6	51.2	38.9	39.1	44.6	456.7	5
W	41.1	16.5	25.4	36.4	38	26	27.2	16.7	15.9	16.6	259.8	7

Source: Own calculations based on National Institute of Statistics, Tempo-Online, 2017 [16]

Table 3. The dispersion of apple production by micro-region, Romania, 2007-2016 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NW	15.8	20.6	23.1	17.7	25.2	23.7	27.2	29.6	28.8	26.9
C	9.8	23.5	16.5	15.8	11.3	11.1	11.5	13.9	12.5	11.5
NE	16.6	19.1	20.6	16.2	17.4	18.2	15.6	17.8	17.6	16.2
SE	6.9	6.6	5.1	7.5	7.6	6.6	6.6	7.2	7.2	7.1
S Munt.	33.2	18.5	20.8	25.9	22.4	25.4	23.7	20.5	22.2	25.0
Buc. If.	0.1	0.3	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2
SW Olt.	8.9	6.8	8.8	10.2	10.7	9.2	10	7.6	8.2	9.6
W	8.7	3.8	4.9	6.6	6.3	5.6	5.2	3.2	3.3	3.6

Source: Own calculation based on National Institute of Statistics, Tempo-Online, 2017 [16]

The concentration degree of apple production. The values of HHI and GSI reflected a moderate concentration of apple production, with a few differences among micro-regions.

The HHI values varied between 0.1926, the highest level in the year 2007 and 0.1700, the lowest level recorded in 2010, and 0.1910 in 2016. The GSI values ranged between 0.2779, the highest value in 2007 and 0.2268, the lowest value and 2010 and 0.2747 in 2016 (Fig.6).

The apple yield increased by 20 % from 7.75 tons per ha in 2007 to 9.3 tons/ha in 2014. The highest performance, 1,073 tons/ha was carried out in the year 2011, considered the most favorable one (Fig.7).

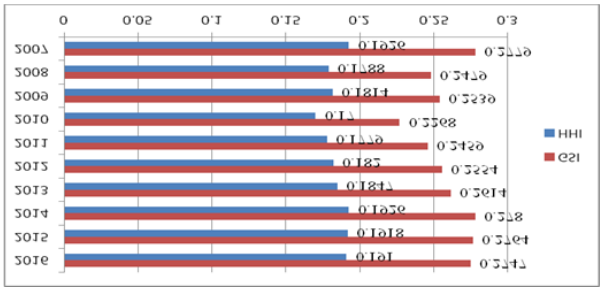

Fig.6.The dynamics of the concentration degree for apple production in terms of HHI and GS, Romania, 2007-2016

Source: Own design based on National Institute of Statistics, Tempo-Online, 2017 [16]

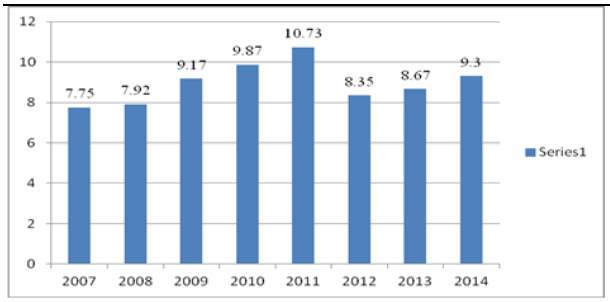

Fig.7.The dynamics of apple yield, Romania, 2007-2016 (Tons/ha)
Source: Own design based on National Institute of Statistics, Tempo-Online, 2017 [16]

Fig.8.The dynamics of apple yield, Romania, 2007-2016 (kg/apple tree)
Source: Own design based on National Institute of Statistics, Tempo-Online, 2017 [16]

Photo 3. Apple production

The apple yield in terms of kilograms per apple tree, it also recorded an ascending trend from 15 kg/tree in 2007 to 19 kg/tree in 2016, the maximum yield of 21 kg apples/tree being recorded in the year 2011 (Fig.8).

The dispersion of the average apple production in terms of kg/apple tree by micro-region is presented in Table 4.
In the analyzed period, only three micro-regions registered an increase of average apple production in 2016 compared to 2007 as follows: NW (+157%), Center (+40%), and ME (+12.5%). The other regions registered a decline as follows: SE (-5.9%), S Muntenia (-3.2%), SW Oltenia (-4.8 %), West (-36.8 %) and Bucharest Ilfov (-46.2 %) (Table 4).

Photo 4. Jonathan Apples

Table 4. The distribution of apple yield by micro-region, Romania, 2007-2016 (kg/tree)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NW	15	15	17	18	21	17	19	19	19	19
C	7	10	13	12	21	15	20	21	19	18
NE	10	22	20	19	13	10	12	15	14	14
SE	17	16	15	21	25	15	17	20	19	16
S Munt.	32	18	22	30	30	31	32	28	28	31
Buc. If.	13	20	22	9	15	14	10	10	8	7
SW Olt.	21	15	19	22	28	18	21	15	17	20
W	19	12	14	10	16	11	13	14	14	12

Source: Own calculation based on National Institute of Statistics, Tempo-Online, 2017 [16]

CONCLUSIONS

The study reflected a slight decline in apple production (-1.8 %) in 2016 compared to 475/4 thousand tons in 2007.

This was determined by the reduction of the surface of apple tree plantations (-6.2 %) and of the number of apple trees due to the orchards aging, the low performance, the lack of maintenance, the use of the old uncertified varieties in extensive plantations. But, it was

positively influenced by the increase of apple yield (+20%) in terms of tons per ha.

The concentration degree of apple production is a moderate one in terms of HHI, whose values ranged between 0.1926 in 2007 and 0.1910 in 2016. The GSI also confirmed a moderate concentration of apple production, its value ranging between the peak of 0.2779 recorded in 2007 and 0.2747 in 2016.

However, Romania's performance in apple production is a few times lower compared to the one achieved in other EU producing countries.

Taking into account the variety of relief, especially the soil quality and exposure of the holly areas and slopes, the fact that about 35 % of the population lives in the rural areas, the climate which favors the accumulation of flavors, vitamins and minerals and sweetness in apples, the existence of Romanian and imported varieties with high production potential, Romania could become a more important apple producer in the EU.

This imposes new investments in intensive and super-plantations with 3,500 trees/ha, the use of certified planting material, the pest control, irrigations and protection systems against hail, the increase of the orchards size at an optimum level to assure the implementation of modern technologies and equipment, and the economic efficiency in apple tree growing.

Apple trees could be successfully cultivated in almost all the micro-regions of Romania at a large scale and could increase easily production to cover better the internal consumption which at present is balanced by import.

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ELASTICITY OF APPLE PRICE DEPENDING ON OFFER IN ROMANIA

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Abstract

The paper aimed to analyze the elasticity of apple price in close relationship to apple output in Romania based on the empirical data provided by the National Institute of Statistics for the period 2007-2015. Apple price increased by 19.7 % from Lei 2,230 per ton in 2007 to Lei 2,670 per ton in 2016, while apple production declined by 1.8 % from 475.4 thousand tons in 2007 to 467.3 thousand tons in 2016. The elasticity was determine in two variants:(V1) the year 2007 being term of reference, and V2, all the years were considered term of reference one by one. The coefficients of elasticity showed that apple production has a deep impact of apple price. In case of V1, in six years (2008, 2010, 2012, 2013, 2014, and 2015), the apple price was very elastic, while in two years (2009 and 2011), it was relatively elastic in relation to the change in apple production. In case of V2, in three years (2008, 2011 and 2014), the apple price was very elastic, in other three years (2010, 2013 and 2015), it was relatively elastic, in one year (2009), it looked to be unitary and in one year(2012), it looked to move to perfect inelastic. All these results, confirmed the H_0 hypothesis that the variation of apple production leads to apple price volatility. As a consequence, apple tree growers must create associations which are the only chance to reduce the expenses for farm inputs, to increase apple production and quality, to keep under control production cost, to store the production for a longer period of time to protect it against hail and degradation, to preserve it in the best conditions and to deliver it in the market at a higher price in the periods when the offer will be lower. In this way, they apple production will have a better impact on price and farmers could get a higher profit.

Key words*: *apple price, apple production, coefficient of elasticity, Romania

INTRODUCTION

Apples are the most important fruit in Romania's market due to consumer's preferences for its special taste and flavor, nutritive and therapeutic properties given by its chemical composition, and the possibilities of perservation for a long period of time from summer to next spring under peculiar storage conditions (temperature, hygiene, humidity, cleaneness, light etc) [1, 3, 6].

Apple consumption has continuously increased, for example, only in the period 2010-2014, it has grown by 12 %, being at present of 25.2 kg/inhabitant.year. Apples are on the top position among other fruits. Of the annual consumption/inhabitant of about 76.3 kg fruits, apple consumption represents 33 % [9].

Apple production like in case of other fruit output, has annual variations due to a large range of factors, among the major ones being: climate change, the used apple tree varieties, technological factors.

The seasonality of apples is lower compared to other fruits produced in Romania such as cherries, strawberries, appricots, peaches, melons and grapes.

Apples are among the perishable fruits, but their loss of woeght and qualitative degenerations are reduced than in case of pers, plums and grapes and could be successfully avoided by a corresponding conservation in climitazed storages.

Apple production has a deep influence on apple price both at farm gate and at the consumer level. Each variation in apples output from a year to another determines changes in a way or another in apple price.

Apple production has recorded a decline during the last decade, due to the reduction of the surface covered with apple trees orchards and of the number of grown trees [2].

For this reason, apple production is not enough to cover consumer's needs, which justify the import of apples [8].

The relationship between production and price is very strong. In order to analyze the measure in which apple price responds to production change, the economists have set up the coefficient of elasticity [5, 10].

The elasticity of apple price depends on apple output and it reflects the change in price according to the change in production (offer) in the market [4].

In this context, the paper aimed to analyze the elasticity of apple price based on the variation of apple production in Romania in the last ten year, 2007-2016 in order to establish in what measure apple price was influenced by production. Therefore, the H_0 hypothesis taken which has to be checked in this study is that the variation of apple production leads to apple price volatility.

MATERIALS AND METHODS

The paper is based on the empirical data regarding apple production and apple price provided by the National institute of Statistics, Tempo-online Data Base for the period 2007-2016.

The data were analyzed using statistical methods in order to establish the main parameters such as: mean, standard error, standard deviation, coefficient of variation, and regression.

The coefficient of elasticity (E_Y) was determined using the formula:

$$E_Y = \frac{\Delta Y\%}{\Delta X\%} = \frac{\frac{\Delta Y_i}{Y_0}}{\frac{\Delta X_i}{X_0}} = \frac{\Delta Y}{\Delta X} \cdot \frac{X_0}{Y_0}$$

where:

$\Delta Y\%$ is the percentage deviation of apple price, $\Delta X\%$ is the percentage deviation of apple production, $\frac{\Delta Y}{\Delta X}$= 1/tangent slope to price curve, and X_0, Y_0 represents the point of the price curve where elasticity was computed.

The coefficient of elasticity (E_Y) was determined for two variants as follows: (V_1) where the year 2007 was considered as term of reference and (V_2) where each value of the chronological series was considered, one by one, term of reference or fixed basis.

The results were presented in tables and graphics to illustrate the them much better.

RESULTS AND DISCUSSIONS

The evolution of apple price.

Apple price has varied from a year to another, but the general trend was an ascending one from Lei 2,230 per ton in 2007 to Lei 2,670 per ton in 2016. In the year 2010 it was recorded the lowest apple price (Lei 2,160 per ton), and the highest price was Lei 2,790 per ton in the year 2013(Fig.1.).

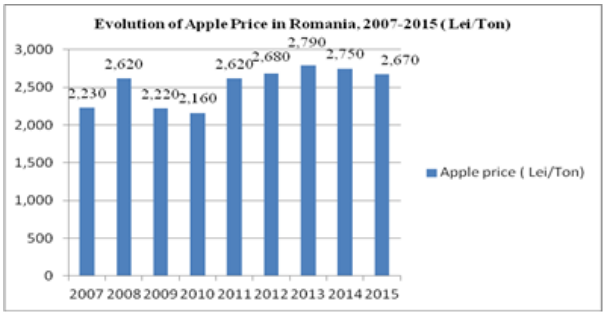

Fig.1.The evolution of average apple price in Romania, 2007-2015 (Lei/Ton)

Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

The evolution of apple production.

Apple production varied between 475.4 thousand tons in the year 2007 and 467.3 thousand tons in the year 2016.

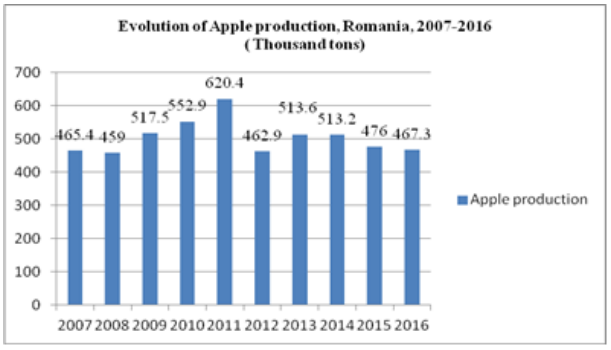

Fig.2.The evolution of apple production in Romania, 2007-2016 (Thousand tons)

Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

Therefore, the general trend was a declining one determined by the reduction of the surface covered by apple tree orchards and the number

of apple trees. The top production was noticed in the year 2011 (620.4 thousand tons) and the lowest performance in the year 2012 (462.9 thousand tons) (Fig.2).

The descriptive statistics for apple price and apple production is presented in Table 1.

The mean value for apple price was Lei 2,526.66 per ton and for apple production 504.82 Thousand tons for the whole analyzed period. The variation coefficients had low values reflecting that the data were closely arranged around the average value of the both indicators (Table 1).

Table 1. Descriptive statistics for apple price and apple production, Romania, 2007-2015

Parameter	Apple price	Apple production
Mean	2,526.66	504.82
Standard error	83.09	16.22
Standard deviation	249.29	51.23
Minimum	2,160	459
Maximum	2,790	620.4
Coefficient of variation (%)	9.86	10.14

Source: Own computation based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

Table 1.Coefficients of elasticity for apple price depending on apple production in case of V1

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Apple price (Lei/Ton)	2,230	2,620	2,220	2,160	2,620	2,680	2,790	2,750	2,670
$\frac{\Delta Y_{i-}\Delta Y_0}{Y_0}$	0	0.174	-0.004	-0.031	0.174	0.201	0.251	0.233	0.197
Apple production (Thousand tons)	475.4	459	517.5	552.9	620.4	462.9	513.6	513.2	476
$\frac{\Delta X_{i-}\Delta X_0}{X_0}$	0	-0.034	0.088	0.163	0.305	0.026	0.080	0.079	0.001
E_Y	-	-5.11	-0.05	-0.19	0.57	7.67	3.12	2.93	156.1

Source: Own computation based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

The coefficients of elasticity of apple price depending on apple production in case of V1, 2007 being considered as term of reference are presented in Table 1.

In the year 2008, the coefficient of elasticity, E_Y = -5.11 reflected that a small change in apple production caused a relatively high change in apple price. Therefore, the price was *very elastic*. In other words, if production declines by 1 %, the apple price will increase by 5.18 %.

In 2009, E_Y = -0.051 showing that apple price was *relatively elastic*, as a change of 1 % in production determined a very small change of the apple price.

In 2010, E_Y = -0.193 reflected the trend of the apple price to become *more elastic* for a change of 1 % in apple production.

In 2011, E_Y = 0.573 suggested that both the price and production went in the same direction, a change of 1 % in apple production determined a low variation in apple price, therefore, the price looked to become *relatively elastic*.

In 2012, E_Y = 7.674 meaning that the price was *very elastic*. For an increase of 1% in apple production, apple price will increase by 7.67 %.

In 2013, E_Y =3.125 reflected the same situation like in 2012, i.e. for an increase of 1 % in case of production, apple price will raise by 3.12 %. The price was *very elastic*.

In 2014, E_Y = 2.93 showing a similar situation like in 2013, if production would grow by 1 %, apple price would also move in the same direction increasing by 2.93 %. The price was *very elastic*.

In 2015, E_Y =156.1 reflected a *very elastic* price in relation to apple output.

The coefficients of elasticity of apple price depending on apple production in case of V2, each year being considered term of reference, one by one. The results are presented in Table 2.

Table 2.Coefficients of elasticity for apple price depending on apple production in case of V2

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Apple price (Lei/Ton)	2,230	2,620	2,220	2,160	2,620	2,680	2,790	2,750	2,670
$\frac{\Delta Y_{i-}\Delta Y_0}{Y_0}$	0	0.174	-0.152	-0.027	0.212	0.023	0.041	0.014	-0.029
Apple production (Thousand tons)	475.4	459	517.5	552.9	620.4	462.9	513.6	513.2	476
$\frac{\Delta X_{i-}\Delta X_0}{X_0}$	0	0.034	0.127	0.068	0.122	-0.253	0.109	-0.0007	-0.072
E_Y	-	5.11	-1.19	-0.39	1.73	-0.09	0.37	-20	0.40

Source: Own computation based the data provided by the National Institute of Statistics, Tempo online, 2017[7].

In 2008, E_Y = 5.11 reflecting that the price was *very elastic*, for 1 % growth of apple production, the price increased by 5.1 %.
In 2009, E_Y = -1.19 showing a *relatively unitary price*, as for a decline of 1 % in apple production, the price declined also by about 1 %, therefore in this year the price was not elastic.
In 2010, E_Y = -0.39 meaning that for 1 % growth of production, the price was diminished by 0.39 %, therefore it is about a *relatively elastic* price.
In 2011, E_Y = 1.73 reflecting that the price was *very elastic*, at 1 % production increase, the apple price went up by 1.73 %.
In 2012, E_Y =-0.09, therefore very close to zero. In this case, for a decline of 1 % in apple production, apple price was *perfect inelastic*, it practically did not varied.
In 2013, E_Y = 0.37 reflecting that for 1 % variation of apple production, the apple price increased by 0.37 %. Therefore, the price was *relatively elastic*.
In 2014, E_Y = - 20 reflected that for a diminish of 1 % in apple production, the apple price declined increased by 20 %. Therefore, in this case, it is about the movement in the same direction of the two indicators, but the price was *perfect elastic*.
In 2015, E_Y =0.40 meaning that a decline of 1 % in apple production determined a reduction of 0.4 % in apple price. The price of *relatively elastic*.
The graphical representation of the elasticity coefficients for V1 and V2 is comparatively shown in Fig.3.

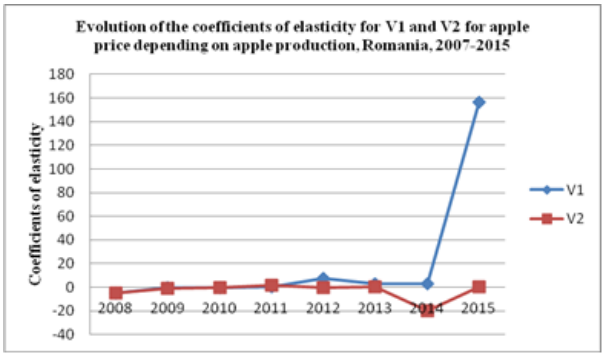

Fig.3.The coefficients of elasticity for apple price depending on apple production, V1 and V2, Romania, 2007-2015
Source: Own design

CONCLUSIONS

In the whole analyzed period of ten years, the apple price was either elastic or relatively elastic, with a few exception when it was stable, unitary.
The apple price volatility showed that it is closely related to apple production.
Apple price evolution depends on the quantity of apples apple produced and delivered in the market and also of apple quality and variety, demand/offer ratio and income/household.
This link between price and apple production is very important for apple tree growers who must be aware that price at delivery must cover production cost and lead top profit. Horticulturists must keep under control production cost, to increase apple production and quality for getting a higher price. The association of apple producers is an opportunity for them to reduce the cost of farm

inputs and to create the possibility to store the production for a longer period of time to protect it against hail and degradation, to preserve it in the best conditions and to deliver it in the market at a higher price in the periods when the offer will be lower. In this way, they could get a higher profit.

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ANALYSIS OF ACCOMMODATION DEMAND/OFFER IN ROMANIA'S TOURISM

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Abstract

The paper aimed to analyze the accommodation demand/offer in Romania's tourism using the empirical data provided by the National Institute of Statistics for the period 2007-2015. In 2015, tourists' arrivals accounted for 9,9 million, of which 22.5 % foreigners' arrivals. The total arrivals increased by 42 % in the analyzed period having a good impact on tourist density which reached 500 arrivals per inhabitant and 32 arrivals per square km. In 2015, the number of overnight stays accounted for 23,519 thousands, of which 19 % belonged to the foreign tourists. The economic crisis had a bad impact on the number of arrivals, and overnight stays in the years 2009and 2010. Romania has 6.821 establishments units with accommodation facilities for tourists and 328,000 beds, meaning by 45 % and, respectively by 15 % more than in 2007. As a result, in 2015, the beds-days increased by 43 %, accounting for 81,872 thousand, and the tourism function of Romania reached 1,650 places (beds) per 1,000 inhabitants. Tourists' arrivals have a positive impact on overnight stays proved by the strong position correlation existing between these two indicators, r = 0.849, and by the determination coefficient, $R^2 = 0.7215$, which proved that 72.15 % of the variation in overnight stays is determined by the variation of the number of tourists' arrivals. The accommodation offer has been improved year by year to satisfy better tourists' demand, but the seasonality of arrivals has causes the low degree of occupancy. The business in tourism should be focused much more on a better promotion of Romania's tourism offer and on the assurance of a higher quality of services to face the strong competition among countries to attract more tourists.

Key words**:** *accommodation, demand, offer, tourism, Romania*

INTRODUCTION

During the last decades, tourism has become one of the fastest growing economic branches in the world economy with a deep impact on the socio-economic progress.

Tourism business has surpassed oil exports, food products or automobiles, playing a major role in international commerce, and being an important source of income for many countries.

In 2015, international tourists' arrivals accounted for 1,184 million and generated USD 1.5 trillion in export earnings. At world level, tourism contributes by 10 % to GDP and 1/10 jobs, it contributes by USD 1.4 trillion to exports, representing 7 % of the world exports and 30 % of the service exports.

The hospitality industry includes a large variety of services such as: lodging, event planning, theme parks, transportation, cruise lines etc. Hotels and other types of lodging units, restaurants, amusement parks and the related personnel etc are involved in the maximization of customers and their satisfaction. The quality of tourism offer assures the growth of tourists flows and revenues [13].

In the EU tourism there are 610 thousand establishments which offer more than 31 million bed places [4].

In the EU-28, the number of nights spent in tourist accommodation reached 2.9 billion overnight stays being by 3.6 % higher than in 2015. Hotels and similar accommodation units are the most preferred (65%), followed by holiday and short stay units such as rented apartments (22%) and camping grounds and recreational vehicle parks (13%).

The number of overnight stays in hotels increased by 3.5 %, and in holiday and other short-stay accommodation also increased by

3.5 %. This was due to the growth of the overnights spent by foreign visitors (+4.7 %) but also of the nights spent by the resident tourists (+1.7 %).

The establishments of touristic reception with functions of tourist accommodation had registered a continuous upward trend in the last decades in Romania [1].

Increasing the total number of tourists and also of foreign tourists, the existence of various accommodation facilities such as hotels, guesthouses urban and rural houses, accommodation capacity being well developed mainly in the capital and the municipalities residence of counties.

The most preferred types of accommodation units are hotels (63.0%), rural guesthouses (27%) and rural houses (21.4%). Foreign tourists usually prefer 4 and 5 stars hotels, and rural guest houses as well [8].

Supply of facilities accommodation is a condition for tourism development and must cover tourist demand. Lodging industry is closely developing in relation to the trends in tourist arrivals [11].

The quality of tourism services within the Romanian accommodation structures is very important to improve the number of tourists arrivals and increase the degree of satisfaction and safety [7].

The number of stays in accommodation units varies by category of comfort, between foreign and Romanian tourists. The large majority of tourists stayed in the establishments of touristic reception of 3 stars comfort, and an increased number of the overnight stays was recorded in the 3 flowers category of comfort in agro-touristic guesthouses [14].

The dispersion in the territory of the accommodation capacity in terms of units and beds, the net usage the accommodation capacity and infrastructure is not yet a corresponding one, reflecting a poor correlation between the services' supply and tourists' demand [3].

The average accommodation capacity has increased, but it is still a lack of additional services and employees especially in hotels, and a poor infrastructure mainly access roads, with a negative influence on investors [6].

In this context, the paper aimed to study the accommodation demand/offer in Romania tourism using the empirical data provided by the National Institute of Statistics for the period 2007-2015. Important aspects such as tourists arrivals, overnight stays, tourist density, establishments in tourism with accommodation function in operation, number of places, number of beds-days, tourism function of the country and the capacity use rate have been approached to analyze the trends and if the actual capacity of accommodation is satisfactory in relation to tourists arrivals and which are the relationships of determination between these indicators.

MATERIALS AND METHODS

The Study area.

Romania is situated in the Central and Southeastern Europe, being the 12th largest country with 238,391 sq. km surface, and a population of 19,334,000 (October 2016). The varied relief is like an amphitheater with mountains, hills and plains, and exit to the Black Sea, and a temperate continental climate with four distinct seasons.

Romania's mountains are a great destination for the tourists loving: climbing, hiking, biking and river-rafting, or skiing.

The Danube River forms a part of the South Western and South frontier along of 1,864 miles and ends forming the well known The Danube Delta which is an UNESCO Biosphere Reservation, a protected wetland and natural habitat for rare species of plants and animals [12].

Romania has about 275 km of seashore at the Black Sea, full of wonderful resorts with elegant hotels, sandy beaches and pleasant seawater which attract tourists May until September [2].

Romania has a rich hydrographic basin consisting of the rivers' net, of which 98% have the springs in the Carpathian Mountains, where the upper streams are spectacular (numerous gorges, caves and precipices). Romania has around 3,500 lakes among which it deserves to be mentioned the lagoons and coastal lakes on the Black Sea shore, the glacial lakes in the

Carpathian Mountains, and also a volcanic lake.

Romania has a large variety of flora and fauna, including over 3,700 species of plants and 33,792 species of animals. Romania has important soil and mineral resources such as a fertile agricultural land, suitable for cereals and technical crops, forages etc, and also vineyards and orchards, pastures and meadows, oil, natural gas, coal, iron and non-ferrous metals, salt, and gold [5].

The main tourist attractions are the Black Sea resorts, the castles and fortresses, the Danube Delta, the medieval towns, the Carpathian Mountains, the Monasteries, the traditional villages, the Spas, the World Heritage sites, the arts and crafts, the Danube River cruises, the Dracula legend, the festivals and events, traditional food and wines, traditions and folklore.

Bucharest, the capital and many other cities like Brasov, Sibiu, Constanta, Cluj-Napoca, Timisoara, Iasi, Oradea, etc. are of high interest for more and more foreign tourists.

Tourism and travel impact.

The direct contribution of Travel & Tourism to GDP in 2014 was RON 10.7 billion, representing 1.6% of GDP, coming from the economic activity run in tourism industry: hotels, travel agents, airlines and other passenger transportation services, restaurant and leisure industries. The direct contribution of Travel & Tourism to GDP is expected to grow by 3.8% to RON 15.9 billion by 2025. The total contribution of travel and tourism to GDP was RON 35 billion in 2014, meaning 4.8 % of GDP. It is expected to increase to about RON 50 billion by 2025.

Travel and tourism activities generated 205,000 jobs directly in 2014 (2.4% of total employment), and by 2015 it is expected to reach 207,000 jobs. The total contribution to employment accounted for 480,000 jobs in 2014 and by 2015 it is expected to account for 490,000 (5.8 % of total employment in the economy).

The foreign visitors exports accounted for about RON 8 billion in 2014, and it expected to reach over RON 14 billion in 2025, representing about 2.5 % of the total exports [15].

The main specific indicators taken into consideration to characterize Romania's tourism related to the topic of the paper data have been the following ones:

-for accommodation demand: (i)the number of tourists arrivals, of which Romanians and foreigners, (ii) the number of overnight stays in establishments with touristic function, and (iii)the tourist density;

-for accommodation capacity or offer: (i) the number of establishments in tourism with accommodation function in operation, (ii)the number of beds (places) in touristic establishments in operation, (iii) the number of beds-days, (iv)the coefficient of the use of accommodation capacity, and (v) the tourism function of the country.

Data collection. The data were provided by the National institute of Statistics, Tempo-online Data Base for the period 2007-2015.

Methodological aspects.

The analysis is based on the time series for the last nine years represented graphically in their dynamics for all the studied indicators.

The fixed index method was used to evaluate the increase or decrease of the variables across the time series, according to the formula: $I_{FB} = (X_n/X_0)*100$.

Also, it was used the linear regression equation, $Y = bx + a$, where Y is de dependent variable and X is the independent variable in order to reflect the relationship of determination between the following pairs of variables: (a) The regression of overnight stays depending on tourists' arrivals; (b) The regression of overnight stays depending on the accommodation capacity in operation in terms of beds-days, and (c) The regression of the number of beds depending on tourists' arrivals.

The ANOVA was used for variance analysis in its components according to the degree of freedom, calculating F stat and its significance, as well as the statistical parameters a and b (intercept and x variable 1) from the regression equation, using the Excel facilities.

The Pearson correlation coefficient was also determined to characterize the relationship between these indicators.

The tourist density (TD) was computed according to the formulas:

$$TD = \frac{\text{Number of tourists' arrivals}}{\text{Population of the country}} \text{ and}$$

$$TD = \frac{\text{Number of tourists' arrivals}}{\text{The country surface}}$$

The coefficient of the use of accommodation capacity (CUAC) was calculated according to the formula [10]:

$$CUAC = \frac{\text{Number of overnight stays}}{\text{Number of beds} * \text{Number of days in operation}} * 100$$

The tourism function of the country (TF) was computed based on the formula [10]:

$$TF = \frac{\text{Accommodation capacity in terms of the number of places (beds)}}{\text{Population of the country}}$$

RESULTS AND DISCUSSIONS

Accommodation demand in terms of tourist arrivals. The number of tourist arrivals in Romania has registered a general increasing trend. In the year 2015, Romania recorded 9,930 thousand tourists by 42,42 % more than in the year 2007.

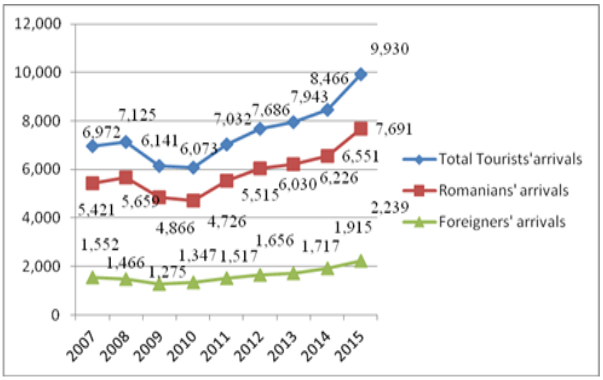

Fig.1.The evolution of the number of tourists' arrivals in Romania, 2007-2015 (Thousands)
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017[9].

Thus, in 2015, the number of tourist arrivals accounted for 9,930 thousands compared to 6,972 thousands in the year 2007. The number of the Romanians' tourist arrivals increased by 41.87 % from 5,421 thousands in 2007 to 7,691 thousands in 2015. At the same time, the number of foreign tourists' arrivals increased by 44.26 % from 1,552 thousands in 2007 to 2,239 thousands in 2015(Fig.1.).

The share of foreign tourists' arrivals in the total arrivals is about 22 % and remained constant across the analyzed period.

The growth of the number of tourists was stimulated by the need of the people to use its free time in relaxation and entertainment, to travel to the desired destinations, to visit various important places of high attraction and other purposes.

Romania is a surprising and unique tourist destination with a complex geography, beautiful landscapes, a large variety of historical vestiges (castles, palaces, fortresses, fortified churches, rustic houses, archeological sites) and cultural values (monasteries, churches, cathedrals, memorial houses, monuments, art galleries, museums, rural houses, traditions and customs in terms of folk music, dances, suits, handicrafts.

The tourists' density in Romania increased by 56.25 % from 320 tourists' arrivals/ inhabitant in the year 2007 to 500 tourists' /inhabitant in the year 2015 (Table 1).

Table 1.The dynamics of tourists' density in Romania, 2007-2015

Year	Tourists' density	
	Tourists' arrivals/Inhabitant	Tourists' arrivals/square km
2007	320	29
2008	330	30
2009	280	26
2010	280	25
2011	330	29
2012	380	32
2013	400	33
2014	420	36
2015	500	42
2015/2007 (%)	156.25 %	144.82

Source: Own calculation based on the data provided by the National Institute of Statistics, Tempo on line data base, 2017 [9].

Also, tourism density increased by 44.82 % from 29 tourists/square km in the year 2007 to 42 tourists/ square km in the year 2015 (Table 1).

The inflexion regarding the number of tourists' arrivals and tourists' density in Romania in the year 2009 and 2010 was caused by the economic crisis.

Accommodation demand in terms of overnight stays. The number of overnight stays in units of accommodation for tourists has also increased by 14.20 % from 20,593 thousand overnight stays in the year 2007 to 23,519 thousand overnight stays in the year 2015. The overnight stays belonging to the Romanian tourists accounted for 19,048 thousand in the year 2015, being by 12 % higher than in the year 2007. The number of overnight stays registered by the foreign tourists increased by 24.73 % in the same period of time, from 3,586 thousands in 2007 to 4,473 thousands in 2015. The share of foreigner's overnight stays in the total number of overnight stays was 19 % in the year 2015 compared to 17.4 % in the year 2007. The decline of the number of overnight stays in the year 2008 and 2010 was determined by the reduction in the number of tourists' arrivals affected by the economic crisis (Fig.2).

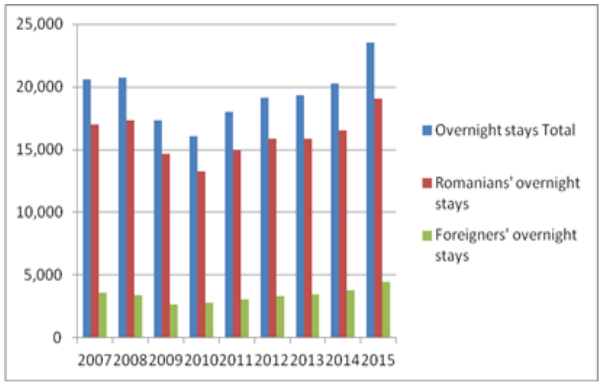

Fig.2.The evolution of the number of overnight stays in Romania's tourism, 2007-2015 (Thousands)
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017 [9].

The accommodation capacity in terms of the number of establishments with touristic function in operation. The endowment in tourism has been improved in order to keep pace with the tourists' requirements for accommodation. The offer of accommodation units has become larger and larger: hotels, hostels, guest houses, camping, bungalows etc in order to better satisfy tourists' requirements. Many establishments were modernized and other new touristic units with accommodation functions were built mainly in the proximity of the main tourist attractions. Thus, in 2015, in Romania there were 6,821 establishments for tourists accommodation, by 45.31 % more than in the year 2007(Fig.3.).

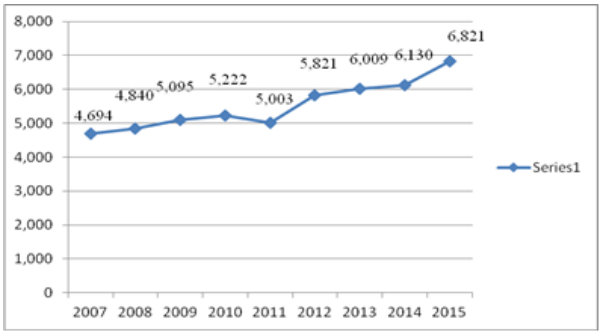

Fig.3. The evolution of the number of establishments for accommodating tourists in Romania, 2007-2015 (Thousands)
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017 [9].

The accommodation offer or capacity in terms of the number of beds (places) in the establishments destined for tourists. Not only **o**f the number of accommodation units has increased in the analyzed period, but also the number of rooms and beds. Thus, in 2015, Romania's tourism had an accommodation capacity of 328 thousand beds, by 15.49 % higher than in the year 2007 (Fig.4).

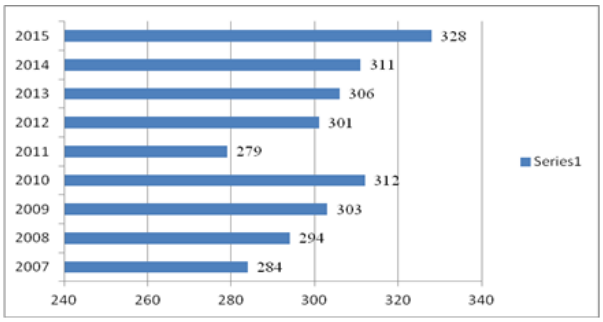

Fig.4. The evolution of the number of beds (places) in the establishments for accommodating tourists in Romania, 2007-2015 (Thousands)
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017 [9].

The accommodation offer in terms of the number of beds-days has grown by 43.29 % from 57,137 thousand in 2007 to 81,872 thousand in the year 2015. This was the result of the growth in the number of places and the

number of days when the establishments operates (Fig.5).

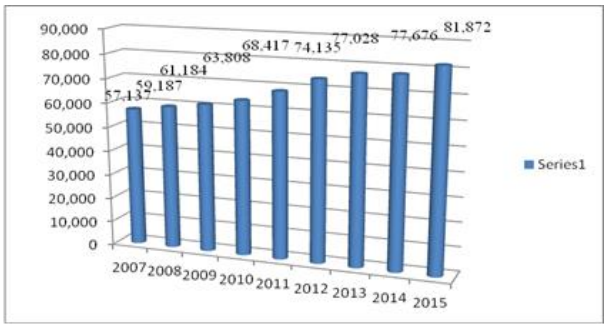

Fig.5. The evolution of the number of beds-days in the establishments for accommodating tourists in Romania, 2007-2015 (Thousands)
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017 [9].

The coefficient of the use of accommodation capacity varied between 36.04 % in the year 2007 and 28.72 % in the year 2015, being positively influenced by the number of overnight stays and negatively influenced by the number of beds and Number of days in operation. The decline of about 30 % in the analyzed period was caused by the increase of beds-days in a higher rhythm compared to the growth rate of the overnight stays.(Fig.6).

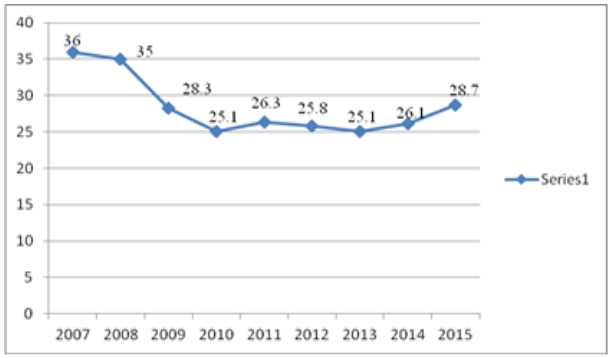

Fig.6. The evolution of the use of the accommodation capacity, Romania, 2007-2015 (%)
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017 [9].

The tourism function of Romania increased from 1.31 bed places/ inhabitant in the year 2007 and 1.65 places (beds)/inhabitant in the year 2015, being positively influenced by the growth of the number of places (beds), which has increased by 15.49 %, and also by the reduction of the population by 7.8 % in the analyzed period (Fig.7).

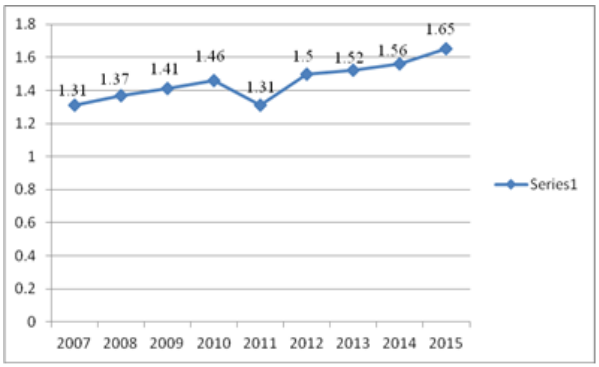

Fig.7. The evolution of the tourism function of Romania, 2007-2015 (No. of beds/inhabitant)
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017 [9].

The regression of overnight stays depending on tourists' arrivals is presented in Fig.6. The regression equation, Y= 1.5482x + 7855.5 shows that for an increase of 1,000 tourists arrivals the accommodation demand in terms of overnight stays will go up by 1,548. Taking into account the t value and the significance threshold P-value, this coefficient is statistically significant.
The value of the determination coefficient, R^2 = 0.7215, is a positive and strong one, reflecting a high relationship between these two indicators (Fig.8.).

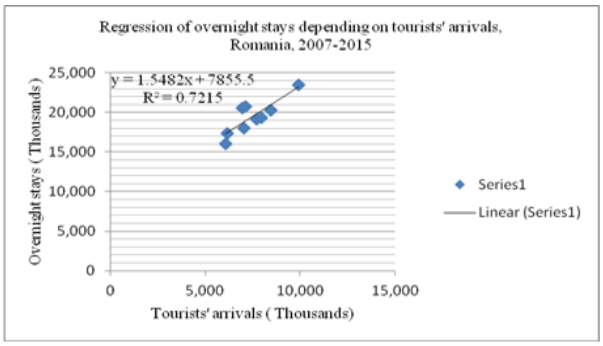

Fig.8. The regression of the overnight stays depending on tourists' arrivals in Romania, 2007-2015
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017 [9].

The regression of overnight stays depending on the accommodation capacity in operation in terms of beds-days is presented in Fig.9. In this case, the regression equation, Y= 0.1011x + 12474, reflects that for increase of the accommodation offer by 1,000 beds-days, the overnight stays with grow by 1,011, this means

not too much. The same situation is confirmed by the coefficient of determination whose value is $R^2 = 0.1745$, reflecting that only 17.45 % of the variation of overnight stays will be determined by the variation of the beds-days. The t value and the P-value reflect that the coefficient is statistically significant (Fig.9).

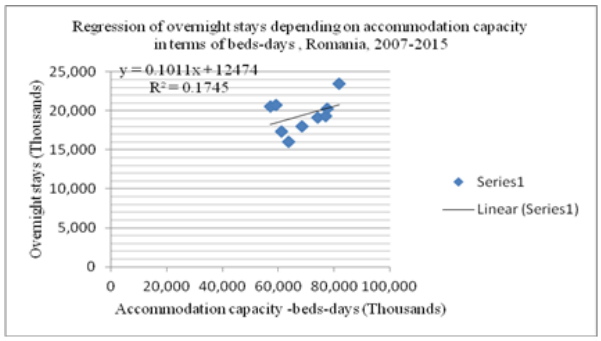

Fig.9. The regression of the overnight stays depending on the accommodation capacity in terms of beds-days in Romania, 2007-2015
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017 [9].

The regression of the number of beds depending on tourists' arrivals is presented in Fig.10.

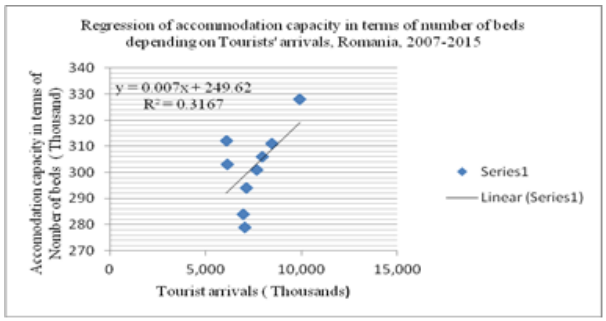

Fig.10.The regression of the accommodation capacity in terms of the number of beds depending on tourists' arrivals in Romania, 2007-2015
Source: Own design based the data provided by the National Institute of Statistics, Tempo online, 2017 [9].

The regression equation, $Y= 0.007x + 249.62$ shows that for increase of the number of tourists by 1,000 beds, the accommodation capacity in terms of the number of beds will remain almost stable, or the increase of 7 beds is practically non significant.
The coefficient of determination, $R^2 = 0.3167$ reflects that just 31.67 % of the variation of the accommodation capacity in terms of beds is a result of the variation in the number of tourists' arrivals. The t value and the P-value reflect that the coefficient is statistically significant (Fig.10).

CONCLUSIONS

In Romania, the accommodation demand in terms of tourists' arrivals increased by 42.42 % in the period 2007- 2015. In 2015, the total arrivals accounted for 9,9 million, of which 22.5 % belonged to the foreign tourists.
The tourist density also increased and reached 500 tourists' arrivals /inhabitant and 42 tourists' arrivals per square km in the year 2015. As a consequence, the number of overnight stays accounted for 23,519 thousands in 2015, of which 19 % belonged to the foreign tourists.
The inflexion in the number of arrivals, tourist density and overnight stays in the year 2009 and 2010 was the result of the economic crisis.
In the year 2015, the accommodation offer in Romania accounted for 6.821 units with accommodation facilities for tourists and 328,000 beds, meaning by 45 % and, respectively by 15 % more than in 2007. As a consequence, the number of beds-days reached the performance of 81,872 thousand in 2015, by 43 % more than in 2007.
However, the coefficient of the use of accommodation capacity was only 28 % in 2015, but the tourism function of Romania increased reaching 1,650 places (beds) per 1,000 inhabitants.
The regression between the overnight stays depending on tourists arrivals reflected that an increase of 1,000 tourists arrivals, the overnight stays will go up by 1,548, due to the strong positive coefficient of correlation existing between these two indicators, and the determination coefficient, $R^2 = 0.7215$ proved that 72.15 % of the variation in overnight stays is determined by the variation of the number of tourists' arrivals.
However, the regression of the overnight stays depending on the accommodation capacity in operation in terms of beds-days showed that only 17.45 % of the variation of overnight stays was determined by the variation of the beds-days, and in case of the regression of the number of beds depending on tourists' arrivals, only 31.67 % of the variation of the

accommodation capacity in terms of beds was the determined by the variation of tourists' arrivals.

This analysis regarding the accommodation demand/offer in Romania's tourism reflected that the tourism operators have prepared a high quality and large variety of accommodation facilities for tourists.

However, the degree of occupancy is not the corresponding one due to the seasonality in tourists' arrivals, and sometimes due to the lack of correlation between the quality of tourist services and the applied tariffs, aspects which could be improved in order to face better to the strong competition among countries to attract more tourists.

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ANALYSIS OF PAKISTAN'S SERICULTURE INDUSTRY IN HISTORICAL PROSPECTIVE

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Abstract

Sericulture, as a cottage industry, can play an important role in the well-being of deprived rural populations and eventually foster the growth of the economy. The Pakistan sericulture industry experienced abundant growth and progress during early decades of independence. Currently, however, this industry is almost defunct. Acknowledging the importance of the issue, this study explores past experience to formulate policy to stabilize the sericulture industry of Pakistan. This study is based on qualitative data. Primary data was collected from stakeholders involved in different activities of the sericulture industry. For better understanding of this sector, primary data was also supported by secondary data from relevant literature. Results of the study indicate that although the sericulture industry was historically profitable, which with the passage of time it has collapsed due to several reasons; it can be reinstated with more attention and commitment.

Key words**:** *sericulture, rural development, employment opportunities*

INTRODUCTION

The cottage industry holds an important position in both the rural as well as urban set up of Pakistan. The significance of sericulture lies in its huge capacity to absorb the labour force, especially women and the youth. It produces a variety of goods and is helpful in lessening the import burden. After the independence of Pakistan, sericulture was marked as an important cottage industry and special attention was given to it. Till the era of 1990s, sericulture remained a flourishing and profitable form of entrepreneurship in Pakistan. At that time, it was a supportive occupation and that provided a supplementary source of income to poor communities involved in sericulture. After 2000-2001, the decline of this industry began due to several reasons explored in this study [2].

Currently, the productivity and efficiency of cocoon yield in Pakistan is very low. In comparison to Pakistan, sericulture is flourishing in neighbour countries like China, India, Bangladesh, and states in Central Asia and Africa as they have a clear vision and focus to promote this sector. To develop sericulture these countries have established separate sericulture boards, (Central Silk Board India, Bangladesh Silk Board) [3] directorates, research centers and educational institutes, and there is a strong coordination between governmental, non-governmental, international welfare and development organizations (International Sericulture commission (ICS), BRAC) [8].

Pakistan's annual domestic cocoon demand of 750 metric tons is met by imports from China, Iran and Central Asian states (Sabir, 1997, as cited in Ahmad and Shami, 1999), verified by author during KII with Ghulam Sabir (Deputy Director Punjab Sericulture Department) [13].

In this study, a comprehensive literature regarding the status of sericulture industry in Pakistan is sighted.

The main objective of this study is to present an updated insight into Pakistan's sericulture industry and existing infrastructure, with the following specific objectives:

(i) Identify major reasons behind the decline of the sericulture industry and main constraints in its progress in view of past picture of sericulture in Pakistan;

(ii)) Collate facts about the current and actual status, and infrastructure of Pakistan's

sericulture industry by interviews of sericulture stakeholders.

Sericulture is considered as an effective foundation for the efficient use of scarce resources. The sericulture industry is also considered as a tool for poverty alleviation as it offers various self-employment opportunities. It can save foreign exchange, and help to reduce urbanization and its related problems. It requires low investment and simple technology, but well planned infrastructure (Geetha and Indira, 2011) [4].

Promotion of sericulture may cause multi-dimensional benefits in Pakistan like effective utilization of resources, opportunities for employment generation, meeting the local needs and exports, rural development, checking migration from rural to urban areas, positive impacts on climate (Neeraja *et al.*, 2014) [11] and unlimited opportunities and benefits of sericulture eco-system development (Hungar *et al*, 2016) [5]

In 1947, the sericulture department was established as a wing of the forestry department. The sericulture department was established in Punjab in 1947, in Khyber Pakhtunkhwa (KPK) in1952, in Baluchistan in 1959 and in Sindh in 1975. Since considerable efforts were made in the past to promote the sericulture sector in Pakistan, there is a reasonable amount of existing sericulture infrastructure waiting for revival. Moreover, the climate, geography and socio-economic conditions of Pakistan are highly suitable for mulberry cultivation and silkworm rearing (Singhal *et al*., 2010) [15].

The main reasons behind the deterioration of this industry include lack of attention and interest of state, old and less productive silk seeds, lack of standardized conditions and infrastructure, inappropriate rearing sheds, and lack of advancement in policies, research and technology (Ahmad and Shami, 1999) [1].

MATERIALS AND METHODS

This is a qualitative and descriptive research study where primary data was collected from different localities of Pakistan through a structured questionnaire. Key informant interviews (KIIs) and focus group discussions (FGDs) were conducted with stakeholders of the sericulture sector, including sericulture experts, officials, farmers, reelers and traders. For analysis, understanding and elaboration of research objectives, secondary data from various reports, articles, magazines and publications was also considered. Primary data collection of KIIs and FGDs were conducted as mentioned below.

Table 1. Respondents of primary data

Respondents	KIIs	FGDs
Sericulture officials	25	3
Sericulture experts	5	0
Farmers	100	5
Cocoon reelers and traders	5	0
Total	135	8

Source: MS thesis of the author, Muhammad Farooq Hyder.

Twenty-five KIIs were conducted with sericulture officials from 11 localities of Pakistan including Lahore, Kasur (Changa Manga), Sargodha, Mandi Bahauddin, Sarai Alamgir, Multan, Faisalabad, Chechawatni, Hyderabad, Peshawar and Muzafarabad. To gauge farmers' opinions on this industry, 100 KIIs were also conducted through convenient sampling format from six localities. These six localities of Changa Manga, Chechawatni, Faisalabad, Mandi Bahauddin, Sarai Alamgir and Muzafarabad have seen massive silk worm rearing activities in the past and, to some extent, are also currently involved in this sector. In comparison to the past, however, there are very few farmers who are still engaged in such rearing activities. Out of 100 farmers questionnaires, 40 interviews were conducted from Changa Manga, 20 from Chechawatni, 15 from Faisalabad and 10 from Mandi Bahauddin, 5 from Sarai Alamgir and 10 from Muzafarabad. This unbalanced ratio of interviews is due to the least availability of respondents. For the purpose of analysis, descriptive statistics are used and elaborated with through tables.

RESULTS AND DISCUSSIONS

Qualitative results, after detailed FGDs with eight focal groups are arranged in four sections. The first section describes the

historical picture of sericulture industry, followed by reasons for decline, constraints of the industry, and the current status and infrastructure of Pakistan's sericulture industry. Both KIIs and FGDs have informed the following results.

Historical Depiction of the Booming Sericulture Industry

Experts, officials and farmers, during the FGDs, indicated towards a *booming period* of the sericulture industry. This was a growing industry till 1995 and one in which thousands of families were engaged. After the mid-1990s it started moving towards a decline, struggling till 2000, after which a quick decline is observed.

About two decades ago, sericulture was a fruitful occupation in Pakistan for both farming and non-farming families. In Kashmir, Gilgit and Baltistan and the four provinces, silkworm rearing was supporting thousands of families. Around 35,000 to 40,000 families were engaged in this part time activity, from which about 15,000 families were from Punjab alone (Jamali, 2010) [9]. There were hundreds of reeling units in Changa Manga, Lahore, Chechawatni, Multan, Hyderabad, Karachi, and Swat. Quality of domestic cocoons was considered better and superior to imported cocoons of neighboring countries such as India, Bangladesh, Sri Lanka and Central Asian states as mentioned Mian Muslim, Ex-Senior Research Officer, Punjab Sericulture Department. At that time against a domestic cocoon demand of 500 metric tons, the domestic cocoon production was 300 metric tons. In Pakistan during 1980 to 1990, domestic demand of silk seed packets was about 45,000 packets as affirmed Ghulam Sabir, Ex-Deputy Director, Punjab Sericulture Department.

This huge demand of silk seed was fulfilled by the government sericulture department and private companies.

(i)*Quality silk seeds* were available and had good production results. Domestically prepared varieties of silk seed were provided by the sericulture department. Although there was great demand for both domestic and imported seed varieties, quality of Pakistani bivoltine silk seed was considered better and superior to imported silk seeds. According to sericulturists engaged in the KIIs and FGDs, domestic seed production was less than market demand, making it a competitive environment for seed buyers.

Varieties of imported silk seed were provided by private silk fiber reeling groups. The largest share among imported seed providers was that of Gulmerg Silk Company. Korean silk seed variety named "DPR" was considered best for production and was provided by Gulmerg Silk Company and other groups. For cocoon production, about 37,000 packets of imported silk seed were distributed by reeling groups during this booming period (Najam, 2016) [10].

(ii)*Rearing benefit* was a large source of income generation; two to three months of silkworm rearing activity was enough to fulfill basic needs of life for a year. For example, silkworm rearing can support the purchase of wheat for a whole family for an entire year, or bear education or marriage expenses of children in a year, to construct or repair houses, to repay loans or to buy cattle.

Table 2. Utilization of rearing benefits

Benefits	Utilization
Marriage Expenses	25 %
Purchase of Wheat	30 %
Purchased Cattle	9 %
Domestic and Educational Expenses	16 %
Clear the Loans	12 %
Construction and Repairing of Homes	8 %

Source: MS thesis of the author, Muhammad Farooq Hyder.

(iii)*Employment opportunities* were provided to thousands of families who were involved in silkworm rearing activities during the booming period.

Table 3. Number of families involved in sericulture

Punjab	KPK	AJK	Sindh	Baluchistan	Total
15,000 - 20,000	4,000-6,000	6,000 - 8,000	1,500 - 2,000	300-500	26,800 - 36,500

Source: Jamali, 2010. Punjab Sericulture Department, Directorate of Sericulture, AJK [9]

Silkworm rearing, silk reeling, weaving units and cocoon production activities were an

additional and seasonal source of income for these families.

Reasons of Decline

Reasons involved in the decline of this industry drawn from KIIs and FGDs point towards the *lack of government interest* as the primary reason of decline. The sericulture department in Pakistan is working in all provinces, sericulture extension centers exist at district levels and the government is spending a huge annual budget. However, instead of consuming this budget on development of sericulture, it is allocated to salaries and allowances of sericulture officials. The ratio of development to operational expenditure, and the ratio of revenue to budget of sericulture industries are both close to zero.

Destruction of the Pakistani parent (P-1) silk seed is another major reason of decline. Silk seed obtained from pure parental lines is called P-1. The preparation of P-1 is a complex, long and difficult process, taking almost 8 to 10 years. Mian Muslim, a committed and hardworking man who served in the sericulture department as a senior research officer and retired in 1999, introduced 11 different varieties of P-1 (PAK-1, PAK-2, PAK-3, PAK-4, M-101, M-103, M-104, M-107, S-1, PFI-1, PFI-2). In terms of quality and quantity of cocoon production, these varieties have pronounced results. These parent varieties were prepared according to requirements of different climatic zones and were capable to produce more than 40 to 50 kilograms of cocoons, per packet, across areas of Pakistan.

Unfortunately, after Mian Muslim's retirement, despite preserving and further improving these parent varieties, the sericulture research department mixed-up and destroyed these parent varieties. Now, Pakistan does not have a single parent variety and there is a high mortality rate in old, mixed and poor quality silk seeds. While under the sericulture development plan from 2006 to 2011 Pakistan imported silk seed from Bulgaria, this seed was not able to produce the desired results. It was observed that after the fourth sleep, mortality rate of silkworms is very high. This high mortality rate makes it inevitable for sericulturists to leave this sector. *Decrease in mulberry areas* also contributed to the decline in this industry. Changa Manga, Chechawatni and Guttwala/Faisalabad were considered as main places of mulberry plantation in Punjab. Data collection for this study included visits to these forests, where it was discovered that the forest once having countless mulberry trees is now converted into bared ground. Unfortunately, mulberry as well as other types of precious trees could not be preserved and were stolen by timber mafia. The forest Changa Manga no longer exists and the name refers only to a plane ground without trees. Situation of Chechawatni and Guttwala/Faisalabad forests is similar and approaching towards the same end.

Before the *dissolution of Union of Soviet Socialist Republic (USSR)*, Gulmerg Silk Company and some other reelers distributed almost 37,000 packets of imported silk seed per season. In December 1991, USSR was dissolved into 15 countries. To support the economies of these newly established Central Asian Muslim states, the government of Pakistan opened a duty free route for trade. Due to long-lasting war, these countries had a sizable stock of silk cocoons. These states started exporting these cocoons at very cheap prices and Pakistan became a big cocoon market for these Central Asian states. Due to reduction in prices, profit margin decreased and local sericiculturists lost their interest in silkworm rearing but the cocoon reeling industry saw high profits. After stabilizing these Central Asian states invented new markets for their cocoons and prices of imported cocoons rose. Consequently, profit margin of reeling units started to shrink. Due to low production of domestic cocoons and high prices of imported cocoons, reeling units started facing a shortage of cocoon supply and gradually these reeling units closed down.(Derived from KIIs and FGDs).

Constraints of the Pakistani Sericulture Industry

To know the constraints behind the progress of Pakistani sericulture industry, it is important to compare infrastructure and policies of other progressive silk producing countries in the region. Data collected in the detailed FGDs

have identified the following gaps in Pakistan, in comparison to other countries.

(a)Pakistan sericulture industry is not a priority of state as a cottage industry because there is a *lack of advanced research* to determine sericulture potential. There is also a lack of technology, training and techniques to improve sericulture practices in Pakistan.

(b)There is a *lack of specialized work force* in Pakistan, which is a crucial element for this industry. Top silk producing countries in the region, like China, India and Bangladesh, are promoting general as well as specialized education in different fields of sericulture sector from school to the university level. This strategy has produced a specialized workforce for the sericulture sector. In Pakistan, on the other hand, there is no institute or research center which can focus on the development of sericulture specialists.

(c)There is *severe deficiency of governance* on the sericulture industry in Pakistan. The sericulture department is working as a wing of the forestry department, which has only a marginal interest in the industry. There is a barrier between policy making and implementation of these policies due to the lack of check and balance, regulatory authority or specialized researchers and graduates in this department. On the other hand, advanced silk production countries in the region have established separate directorates of sericulture; such as the Central Silk Board (CSB) in India and the Bangladesh Silk Board (BSB) in Bangladesh which deals with matters related to sericulture.

Due to the welfare oriented nature of the sericulture industry, several non-governmental organizations (NGOs) are also playing a remarkable role in this sector in different countries of world. These NGOs are contributing in terms of funding in the areas of extension, training, micro-financing, research and technology. With the help of NGOs sericulture is providing 8.6 million jobs in India and 0.86 million in Bangladesh, but in Pakistan this figure is miniscule. In Pakistan, yet there is a *lack of interest in NGOs* to contribute to the development of sericulture in Pakistan.

(d)*Climate diversity* and its' impact on silk production is another constraint. Currently climate change in Pakistan has led to a prolonged summer season, shortened winter season, higher weather intensity, shorter duration of rains, disturbance in the monsoon schedule, and greater occurrence of uncertain and heavy rain falls. These changes in the climate have a significant impact on silkworm rearing which needs to be mitigated through adopting coping strategies and preventive measures.

Opportunities in Pakistan's Sericulture Industry

In this section existing infrastructure of Pakistan's sericulture industry is explored and classified in three parts.

(i)*Cocoon production*, In silkworm rearing, cocoon production is measured against one packet of silk seed and it is considered as a basic tool to measure the success or failure of farmer's efforts. While there can be variation in the weight of silk seed packets, a standard silk seed packet has an average weight of 16 onuses, consists of 40,000 eggs. The sericulture department recommends that if a family consists of five to six members, then they should rear at least two packets at a time, and three to four packets in a season. During data collection almost all of the farmers responded that they can easily rear two to three packets in a season.

Table 4. Cocoon production remarks

Remarks	Breakeven	Average	Normal/Good	Attractive
Production (KG)	15 – 20	20 – 25	25 – 30	>30

Source: MS thesis of the author, Muhammad Farooq Hyder.

In the current scenario, cocoon production ranging from 15 to 20 kilograms, per packet, is considered the breakeven point. Production ranging from 20 to 25 kilograms is considered average production while production ranging from 25 to 30 kilograms is considered normal and, to some extent, good production. More than 30 kilograms of cocoon production, which is not difficult to attain, is considered attractive production. Historically, Pakistani farmers were easily able to produce more than 30 kilograms of cocoons. Farmers reported that

due to good quality of silk seed they were able to produce more than 40 kilograms of cocoons. Moreover, some Pakistani parent (P-1) varieties prepared by Mian Muslim, like S-1, PFI-1 and PFI-2, gave a record production of over 50 kilograms of cocoons. In the past, regarding per packet cocoon production, satisfaction level of farmers was high and about 84 percent responded that they were able to produce an average of 30 to 35 kilograms of cocoons due to good quality of silk seed.

Table 5. Per packet production in 2013-2015

Production (kg)	0-5	5-8	>8
Results	85%	13%	2%

Source: MS thesis of the author, Muhammad Farooq Hyder.

Currently, 100 percent of farmers are dissatisfied with production results. During the 2013 rearing season, about 2 percent of respondents produced less than 8 kilograms cocoons from one packet of silk seed and about 13 percent produced between 5 to 8 kilograms, while around 85 percent were not able to get any yield as all of their silkworms died during the fourth stage.

Table 6. Cocoon rates

Nature	In Punjab	In AJK
Wet	Rs. 550 – 700	RS. 350 – 500
Dry	Rs. 1,500 – 2,000	RS. 1,350 – 1,500

Source: MS thesis of the author, Muhammad Farooq Hyder.

Cocoons are classified in terms of wet and dry cocoons. After drying, the weight of a cocoon drops to a third of the wet weight. For instance, 10 kilograms of wet cocoons drop to approximately 3 to 3.75 kilograms after drying and the rate of cocoons also increases with this ratio. In the past, when this industry was booming, the price for good quality wet cocoons was about Rs. 200 to 250 and for dry cocoons was about Rs. 600 to 800, per kilogram. These rates were satisfactory due to lucrative production results and high value of money. Currently, rates of good quality wet cocoons range from Rs. 650 to 800 and dry cocoons from Rs. 1,850 to 2,100, per kilogram. While this is still a reasonable rate, due to fewer yields it is not that profitable.

Currently in Pakistan, AJK silk seed varieties are considered more reliable than any other local variety. The relevant department in AJK has assured farmers that if standard rearing requirements are fulfilled than their silk seed varieties are capable of producing up to 20 to 25 kilograms of wet cocoons, per packet. According to this estimation, farmers or families who will rear four packets of silk seed can earn up to Rs. 50,000 to 60,000 in a one and half month's activity. This amount can support the farmers in a better way.

Table 7. Rearing experience

Experience (Years)	20 – 30	30 – 40	>40
Percentage	35%	45%	20%

Source: MS thesis of the author, Muhammad Farooq Hyder.

Table 7 describes that about 35 percent of farmers from the sample have 20 to 30 years of experience; about 45 percent have 30 to 40 years of experience while about 20 percent have more than 40 years of experience. Farmers attached with sericulture in the past are more willing to adopt this profession again as they are aware of the economy and benefits of sericulture.

(ii)*Silk seed varieties.* In Punjab silk seed production laboratory Murree has a production capacity of approximately 5,000 silk seed packets. The production capacity was about 4,000 packets in AJK, but due to massive damage in the 2005 earthquake this capacity has been decreased to 1,600 packets. Therefore, current total silk seed production capacity of Pakistan is about 6,600 packets. The three silk seed varieties used for rearing are mixed and old varieties of Punjab, imported Bulgarian variety and a variety of AJK.

-*Mixed and old variety of Punjab*. In past, Punjab had 11 different parent (P-1) varieties but unfortunately these profitable varieties were destroyed as a result of departmental negligence. Due to the carelessness of laboratory staff during seed production processes, these parent varieties were mixed up with each other. Now, seed of these mixed

varieties is considered a failure because it is old, less resistant to disease and has poor production results.

Table 8. Punjab silk seed varieties

PAK-1	PAK-2	PAK-3	PAK-4	M-101	M-103	M-104	M-107	S-1	PFI-1	PFI-2

Source: MS thesis of the author, Muhammad Farooq Hyder.

-*Imported Bulgarian variety.* Under the sericulture development plan 2006 to 2011, the Punjab sericulture department imported a variety of the Bulgarian silk seed to further produce silk seed. However, this variety was not able to produce desired results. Experts and farmers declared this variety unreliable as it has less resistance and production, and a high mortality rate.

-*AJK varieties.* According to the department of sericulture in AJK, they have 23 types of parent silk seed varieties which, under standardized conditions, are capable of producing about 25 kilograms of wet cocoons, per packet. While in the past varieties of AJK silk seed were considered good, due to the lack of advancement, innovation and technology, production results of these varieties have decreased. Still, AJK seeds are better than other available seeds and capable of further improvement.

Table 9. AJK Silk Seed Varieties

PTK-1	PTK-2	KP-1	KP-2	KP-4	#106	#112	#113
OWC-1	K-1	K-2	Y3-6	KP-3	#133	J-101	#124
JAM-119	JAM-120	SJ	Y5-6	-----	8-J	C-102	#115

Source: MS thesis of the author, Muhammad Farooq Hyder.

(iii)*Moriculture.* Cultivation of mulberry is called moriculture. In this section, available mulberry varieties and their characteristics are discussed. Genetically, mulberry belongs to the *Morus* family and the species and varieties common to rearing purposes in Pakistan are *Morus alba*, *M. alba linn*, *M.laevigata* and *M. latifolia*. Both *M.laevigata* and *M. latifolia* are nutritious and have high protein broad and succulent leaves which positively impact cocoon production as more than 70 percent of proteins in the cocoon are derived from mulberry leaves as mentioned in the Official Report of AJK Sericulture Department, 2012.

Mulberry is mainly propagated by grafting, cutting, seed sowing and tissue culture. Proper time of plantation for rooted plants is December to January while for cutting plantation it is from February to middle of March. In Pakistan available mulberry varieties can be classified into three general categories – tree type variety (Desi Toot), grafted variety, and bush type variety (imported).

-*Tree type variety.* This local variety is also known as "Desi Toot." In comparison to other imported varieties, this local Pakistani variety has different features which make it unique. For instance, it does not require particular care and can be cultivated under diverse environmental conditions. Leaves of this variety have more protein with comparatively richer nutrients. Silkworms that eat leaves of this variety spin fine quality of cocoons and these cocoons have more weight. Shoots of this variety are more strong and flexible. Plants of this local variety grow into a huge tree, producing a strong and demanding timber. This feature is can also be considered as a drawback because leaves picking from such huge trees is difficult for women and children.

-*Grafted variety.* In grafted varieties *M.laevigata* and *M.latifolia* are more useful and produce thick, nutritious and broad leaves along with edible fruit. The seeds produced by these varieties are not fertile and cuttings have poor rooting ability. Therefore, propagating these varieties through normal vegetative methods like cuttings or layering cannot be practiced. In this case bud and cleft grafting is the procedural protocol for its propagation. Phyto-hormones can also be used to promote vegetative propagation as mentioned in AJK Report, 2005.

-*Bush type variety.* Sericulture department has introduced several imported bush type varieties like Japan-early, Japan-late, Ever-green, Latifolia, Punjab-1, Punjab-2, and different varieties from China, Korea and Sri Lanka. Early sprouting, fast growing and easy picking of leaves are three main features of these bush

type varieties. After picking of leaves, leaves regrow and mature for feed in two to two and a half months. Sprouting of these varieties starts early and due to availability of leaves, silkworms can be reared in the desired time. These varieties grow into bushes, making it easy for women and children to pick. Aside from mulberry varieties, the area under mulberry plantation is decreasing day by day and there is a strong need for re-plantation and preservation of existing jungles. In spite of local tree type mulberry plantation, department is promoting imported bush type plantation.

Table 10. Area under Mulberry Plantation (Hectors)

Punjab	Sindh	AJK	KPK	Baluchistan	Total
600 – 800	150 – 200	100 – 150	-	-	850 – 1150

Source: Punjab Sericulture Department, Directorate of Sericulture AJK, Dawn, 2001.

Currently, the area under bush type mulberry plantation is about 600 to 800 hectors in Punjab, about 150 to 200 hectors in Sindh, and about 100 to 150 hectors in AJK. In KPK and Baluchistan there is no specific area allocated for mulberry plantation, and only recently in KPK is the Non Timber Forest Product Department developing huge mulberry nurseries for experiment purposes as affirmed by Pakistan Forest Institute, Peshawar [12].

(iv)*Sericulture extension centers and silkworm rearing areas*. Previously sericulture activities were being performed massively in different areas and cities of Pakistan. Province wise localities of sericulture extension centers and silkworm rearing areas are mentioned below.

Punjab. In Punjab, sericulture extension centers are operating at the district level. Areas where silkworm rearing activities were performed massively in the past and also familiar currently, are Changa Manga, Kasur, Faisalabad, Chechawatni, Samundri, Sarai Alamgir, Khushab, Daffar, Mona, Gujranwala, Mandi Bahauddin, Toba Tek Singh, JhalChakian, Kamalia, Rajana, Jhang, Gujrat, Multan, Jaranwala, Head Faqirian, Rawalpindi, Sangla Hill, Qadir Abad, Taxila, and Kassowal. While in these areas land for mulberry plantation has also been allotted to the department extension centers, it is insufficient and cannot fulfill the demand as needed.

AJK. Sericulture industry is an old and substantial source of income for the rural poor of AJK. Climate and soil of this region has great heterogeneity and diversification. Muzafarabad, Bagh, Poonch and Sudhnoti districts are hilly, whereas Kotli, Bhimber and Mirpur are partially hilly and partially plain. Conditions here are highly favorable for silkworm rearing in both spring and autumn seasons. Rural poor of AJK have less opportunities of employment and rearing season provides an economic incentive for these people. The 2005 earthquake drastically impacted AJK sericulture, damaging infrastructure and seizing rearing and silk seed production activities. Moreover, the filature unit was completely destroyed, negatively affecting livelihoods of about 900 families attached with sericulture.

To extend economic incentives, the AJK sericulture department is promoting (*M. laevigata)* and (*M. latifolia)* and have six mulberry nurseries in Afzalpur, Dhamal, Gorah, and Patikka with the capacity to produce about 0.6 million mulberry saplings annually. Although the AJK sericulture department has strengthen itself in different disciplines of research and technology, it is still lagging in standard requirements. Still, the AJK department has capacity for the development, multiplication and maintenance of pure lines of silkworms. Across all districts of AJK, department have 14 seed cocoon production and egg preservation centers. Annual silk seed production capacity for commercial purposes is about 1,600 packets which are distributed in spring and autumn. These packets are supplied to the government and private sector in different areas of Pakistan. Per packet cocoon production capacity of AJK silk seed is about 10-25 kilograms, which is unsatisfactory and very low in comparison to neighboring countries. Department of sericulture, Muzafarabad also planted about 68,500 mulberry saplings in 477 educational institutes of AJK.

In *KPK*, the sericulture department head office is located in Peshawar and sericulture

extension centers are located in different districts. In the past sericulture activities were performed extensively in the districts of Dera Ismail Khan, Peshawar, Mardan, Swabi, Katlang, Swat, Mengora, Matta, Char Bagh, Dir, Garam Chashma, Haripur, LondKhar, Kohat, Para Chanar, Bannu, Miran Shah, Waziristan, Gilgit/Baltistan, Chitral and Kalash valley. Now, KPK silkworm rearing activities are a story of the past and people have forgotten it.

Sindh. In Sindh, sericulture was initiated on an experimental basis in 1975 at the Miani forest. After successful experimentation it is now extended to Ghotki, Sanghar, Sukkhar, Tharparker, Mirpur Mathelo, Khipro, Naukot and Hyderabad districts. Silkworm breeding center is working at the Miani forest. It provides technical know-how and distribute silk seed to the sericulture extension centers. In Sindh, imported and local silk seed varieties are used for silkworm rearing. Sindh Forestry Department (SFD) has produced more than 10,000 kilograms of cocoons during the last two decades [14].

Two to four crops can be harvested during spring and autumn seasons. However, due to low production sericulturists are not interested in rearing and these rearing activities are shrinking down to a few localities. Provincial secretaries for forest, wildlife and environment stressed the need for development of sericulture as an independent industry like China, Japan, India, Russia and Korea.

Baluchistan. Several areas of Baluchistan are suitable for sericulture and the department of sericulture in Baluchistan executed and conducted several successful experiments in Ziarat and Kalat agencies in the past. Currently, the sericulture department exists here, but is not functional.

In past Changa Manga, Chechawatni, Multan, Peshawar and Muzafarabad were the main cocoon markets and have declined due to limited activities. Now, during the season minimum amount of cocoon trading activities are seen in Changa Manga. Historically, there were hundreds of operational reeling units in Changa Manga, Multan, Karachi, Muzafarabad, Peshawar and Swat valley. Instead of selling cocoons a huge number of farmers preferred to reel their cocoons. These cocoons were reeled with the help of traditional hand type *charkha* and electric motor machines, allowing farmers to earn 30 to 40 percent more money. Along with home based reeling, there was a separate silk reeling industry in Pakistan in which thousands of people were engaged.

With the passage of time and due to the shortage of cocoon availability, majority of reeling units have been closed with few operational reeling units working in Changa Manga, Multan and Karachi. While in the past the department of sericulture Muzafarabad had its own silk reeling filature unit with advanced technology characteristics, this was damaged in the 2005 earthquake and has not been repaired since. (Hyderabad: Promotion of cottage industry urged. (2001, December 3) [6].

CONCLUSIONS

Results of the KIIs and FGDs indicate that sericulture in Pakistan was once a remunerative occupation but due to several reasons and with the passage of time, this industry in Pakistan is near to demise. Results also indicate that promotion of the sericulture industry in Pakistan is not a difficult task but one that requires intention and commitment. It was also proved that promotion of sericulture requires very low capital and is supportive for employment generation.

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YIELDS IN IRRIGATED AND NON-IRRIGATED SYSTEMS. CASE STUDY BRAILA COUNTY

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Abstract

The climate changes represent constraining factors for crops growth and development. The progressive warming of the atmosphere, resulting from the synergic action of several natural and anthropic factors, has contributed to the diminution of rainfall at soil level. The irrigation of crops, a technique by which the soil is directly supplied with a supplementary water input, besides the water received naturally, is absolutely necessary in the conditions of arid weather. The present study refers to the influence of the climate changes and the need for irrigations in Braila county, a county with a high agricultural potential, but also to the yields obtained on the main crops in irrigated and non-irrigated systems. In the period 2006-2015, the effective utilization of agricultural areas equipped with irrigation systems was maximum 33%, while in the years 2006 and 2010 respectively, the utilization degree was under 15%. In all the investigated crops, the average yields per hectare obtained under irrigated system were higher than those obtained under non-irrigated system.

***Key words*:** climate, irrigations, yields, Braila county

INTRODUCTION

Irrigations create favourable conditions for the growth and development of crops, ensuring better and more stable crop harvests, regardless of the natural rainfall and temperature conditions.

In the droughty regions, mainly those subject to the so-called desertification phenomenon, the water consumption of crops is higher than the water quantity stored in soil, and most crops cannot manage in the absence of water.

In the current context marked by deeper climate change „the use of irrigation in agriculture is not only an option, but a necessity to ensure a higher yield of agricultural products" [1], such as "irrigation is a great efficiency measure, by the help of which it can influence the level, the constant and quality of the crops" [6].

The main goal of the hydro-meliorative developments for agriculture and land reclamation works is the preservation and improvement of agricultural land quality. The land reclamation works contribute to the removal of the negative effects of extreme weather phenomena (drought, moisture excess) „have a favourable impact upon the environment by the diminishing the drought risk and aridization control" [5] and to the prevention of soil degradation due to soil erosion. By damming up, drainage and erosion control works, the respective land areas can be used for farming purposes, and the first effect is the increase of the arable land area.

Romania's south-eastern area, where Braila county is located, is subject to significant climate change risk, its effect being reflected in the modifications of temperature and rainfall volume, this contributing to the limitation of the opportunities for economic development, despite the existing agricultural potential.

In order to characterize the climate of a region is necessary to describe the multiannual regime of all the weather elements, in strong connection with the influence of the physical-geographical changing factors

The spatial distribution of Martonne aridity index values on the territory of Romania has been the subject of several researchers' studies [2]; [3]; [4].

MATERIALS AND METHODS

The methodology included the statistical analysis of primary data, using the Excel quantitative analysis software as working tool. The statistical data on which the analysis was based were at the level of Braila county and had the following sources: i) NIS statistical data available on-line – www.tempo-online; ii) statistical data of the Environment Protection Agency Braila, available online – www.apm.braila.ro; iii) statistical data supplied by DADR Brăila and iv) other official data sources.

In order to highlight the continental type of climate variation degree, as well as the need to use hydro-meliorative measures in Braila county, in the period 2006-2015, the aridity index (Em de Martonne) was calculated according to the formula: $I_{ar} = P/T+10$, where P = annual average rainfall, T = annual average temperatures, to which 10 points have been added in order to avoid negative values.

The irrigation system performance in Braila county was analyzed by the calculation of its utilization degree, in the period 2006-2015.

In order to highlight the differences in yields between the crops grown under irrigated and non-irrigated system, on the basis of the official data from DADR Brăila referring to cultivated areas and productions obtained in wheat, maize, barley, two-row barley and sunflower, the average yields obtained under both systems were calculated.

RESULTS AND DISCUSSIONS

Brăila county, located in the eastern part of the Romanian Plain, has two relief units in its componency, namely plain (51%) and river meadow (49%). The low rainfall and non-uniform rainfall distribution result in a water input under the drought limit throughout the vegetation period, mainly in the months of July and August. There are torrential rains in summer time, sometimes with hail, leading to crop damage on extended areas. In the summer time there are also long periods of drought (60-90 days).

The annual rainfall was under the optimum threshold for the development of crops (450 mm) in four out of the ten years of the investigated period (Table 1).

Table 1. The multi-annual average quantity (1975 – 2000) and the annual quantity of rainfalls in the period 2006 – 2015 in Braila county – mm

1975-2000 average	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
425.	350.	478.	338.	420.	653.	356.	633.	491.	479.	525.

Source: Agency for Environmental Protection Brăila, Annual reports regarding environmental state for Braila county, 2009-2015

The aridity index, which reflects the variation degree of the continental climate type and of the weather conditions favourability for the green cover was largely below 22, which is a value characteristic for the maximum aridity areas (Table 2).

Table 2. The aridity index at Braila county level, in the period 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Aridity index	16.5	21.3	15.2	19.1	30.2	16.7	29.8	23.5	21.9	23.6

Source: own calculations after the Em de Martonne method

In the periods when the annual rainfall is low and cannot contribute to obtaining high yields, the water deficit must be covered by irrigations. The irrigation utilization represents the indispensable hydro-technical measure, under the conditions of arid and droughty weather in Braila county.

The arable land prevailed in the agricultural land structure in Braila county, accounting for 90%; the arable land area was by 2,381 ha larger in the year 2015 compared to that in the year 2006, which was mainly due to the diminution of areas under orchards and vineyards (Table 3).

In the year 2015, the non-agricultural land in Braila county was smaller by 1,811 ha compared to that in the year 2006, due to the drastic diminution of areas under waters and ponds.

The hydro-melioration system of Braila county was organized into two administration units and one zonal system: Administration Unit North Brăila, Administration Unit South Braila and the zonal system Big Island of Braila.

Table 3. The lands' utilization structure in the period 2015 opposed to 2006, in Braila county – ha

	2006	2015	2015 vs 2006
Agricultural, of which:	388,100	389,907	1,807
- arable	349,401	351,782	2,381
- pastures	33,144	33,151	7
- vineyards and orchards	5,555	4,287	-1,268
Nonagricultural, of which:	88,476	86,665	-1,811
- forests and other forest vegetation	27,919	30,047	2,128
- waters and ponds	32,662	26,417	-6,245
- constructions	12,297	14,094	1,797
- communication and rail ways	8,490	8,136	-354
- degraded and unproductive lands	7,108	7,971	863

Source: Own calculations after data supplied by ARDD Brăila, March 2017

The irrigation and drainage works were distributed by 13 hydro-meliorative developments, with a total area equipped with irrigation facilities of 357,488 ha as well as areas equipped with drainage facilities, out of which 226,331 ha for pumping and 41,769 ha for drainage (Table 4).

Table 4. The agricultural settled area in Braila county, in 2015

	Agricultural arranged area ha	No. IWUO	Agricultural area contracted for irrigations by IWUO ha
Total, of which :	357,488	113	91,549
North Braila Terrace	122,338	43	28,627
South Braila Terrace	170,489	57	14,401
The Big Island of Braila	64,661	3	48,521

Source: MARD, The National Register of Land Improvement Organization, July, 3 2015

South Braila Terrace had the largest area equipped with irrigation facilities, accounting for 48% of total area, followed by North Braila Terrace, with 34%, while the remaining 18% was represented by the zonal system the Big Island of Braila.

In the year 2015, 113 Irrigation Water Utilizers Organizations (IWUO) operated in Brăila county, which contracted to irrigate only 25.6% of the agricultural area equipped with irrigation facilities at county level.

The zonal system the Big Island of Braila, although with the smallest number of IWUOs, these had signed contracts to irrigate over 75% of the agricultural area equipped for irrigation of the respective system.

The most important parameter for the irrigation system performance is its utilization degree. In the period 2006-2015, the effective utilization degree of the agricultural areas equipped with irrigation systems was maximum 33%, and a utilization degree under 15% could be also noticed, in the years 2006 şi 2010 (Fig. 1).

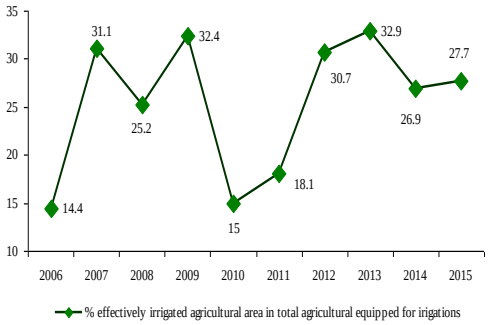

Fig. 1. Evolution of effective utilization degree of areas equipped with irrigation systems
Source: own calculations

There are significant variations of the effectively irrigated agricultural areas, in Braila county, from year to year, and these can be partially explained by the environmental conditions; but at the same time, they are also conditioned by the access to irrigation subsidies.

Throughout the investigated period, over 92% of the cultivated areas in the county were covered by two great categories of crops: grain cereals and oilseeds. For instance, in the year 2010, the grain cereals were cultivated on 60.2% and the oilseeds on 32.2% of total cultivated areas, while in the year 2015 the cereals were grown on 58.1% and the oilseeds on 34.4% of total cultivated areas. The high share of areas under cereals is specific for the extensive farming practice (Fig. 2).

Among the grain cereals, three crops were cultivated on the largest areas: maize grain, wheat and rye, barley and two-row-barley; among the oil crops, the largest areas were cultivated with three crops: sunflower, rapeseed and soybean.

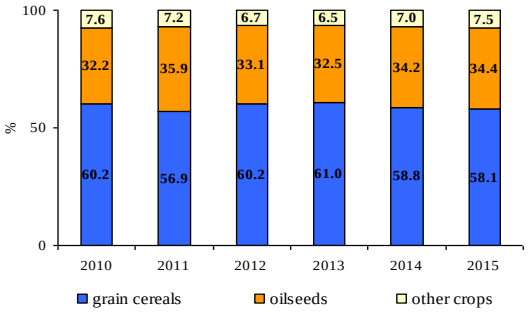

Fig. 2. Share of areas under grain cereals and oilseeds in total cultivated area
Source: NIS, data base www.tempoonline

On the basis of ARDD Brăila data referring to the evolution of cultivated areas and total productions, under irrigated and non-irrigated system, which were available only for the period 2010-2015 and only for the crops maize grain, wheat, barley, two-row barley and sunflower, we calculated the obtained average yields.

The differences between the yields per hectare under irrigated system and the yields under non-irrigated system were maximum 2 t/ha in wheat (2015), 1.8 t/ha in barley, 1.6 t/ha in two-row-barley (2015), 3.4 t/ha in maize (2012) and 1.4 t/ha in sunflower (2011).

In the whole investigated period, the yields per hectare were higher in all the five crops when the crops were irrigated.

However, in certain crops, the potential average yield of the area was not achieved.

(a)In non-irrigated wheat, only in the years 2011, 2013 and 2014 the average yields per hectare were higher than the potential average yield of the area for this crop, estimated at 4.2 t/ha; in irrigated wheat, in the whole analyzed period, the potential average yield of the area, estimated at 6 t/ha, was not reached.

(b)In non-irrigated barley, only in the years 2012 and 2014 the average yields reached the potential average yield of the area for this crop, estimated at 4.8 t/ha; in irrigated barley, in the whole analyzed period, the potential average yield of the area, estimated at 7.2 t/ha, was not reached.

c)In two-row barley, cultivated both under irrigated and non-irrigated system, the potential average yields of the area were not reached, estimated at 7.2 t/ha and 4.2 t/ha respectively;

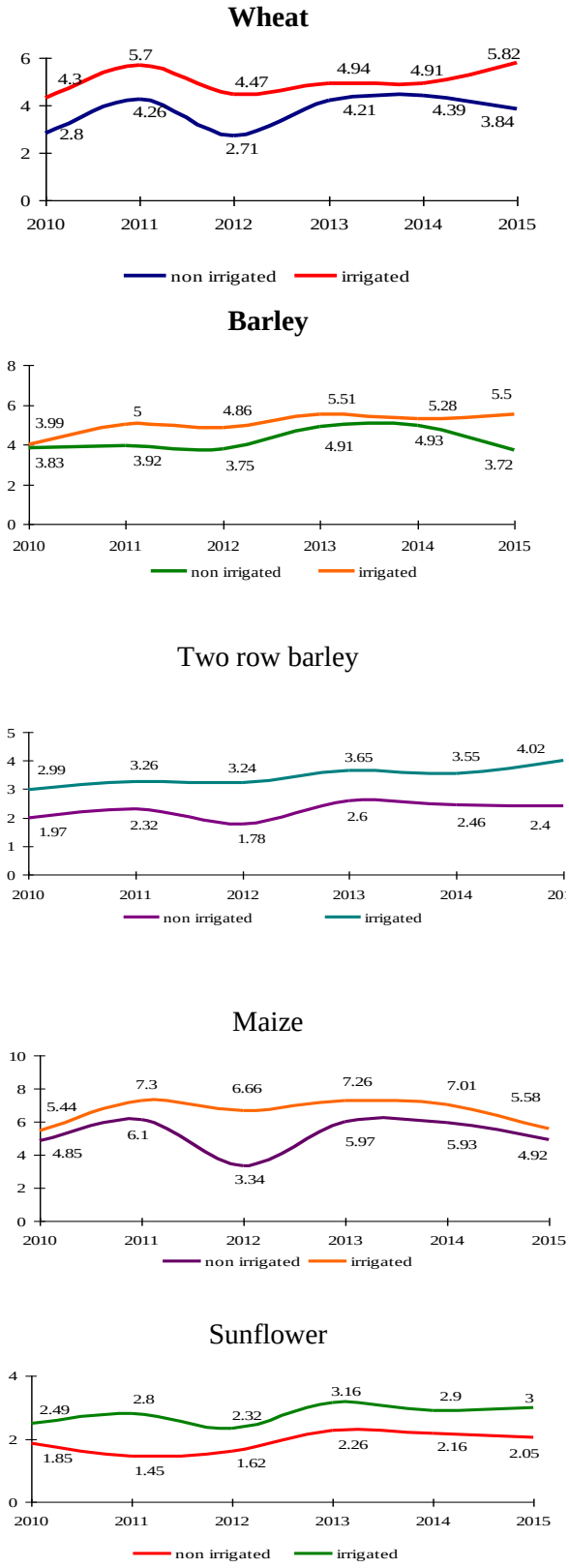

Fig. 3. The average yields obtained under irrigated and non-irrigated system in Braila county (t/ha)
Source: own calculations based on data supplied by ARDD Braila, march 2017

(d)In non-irrigated maize, except for the year 2012, the potential average yield of the area, estimated at 4.8 t/ha, was by far exceeded, in the whole investigated period; in irrigated maize, it is only in the years 2011 and 2012 that average yields per hectare were obtained that were higher than the potential average yield of the area, estimated at 7.2 t/ha;
(e)In non-irrigated sunflower, in three out of the six analyzed years, the obtained average yields were higher than the potential average yield of the area, estimated at 1.92 t/ha; in irrigated sunflower, also in three out of the six analyzed years, the average yields were higher than the potential average yield in the area, estimated at 2.64 t/ha.

CONCLUSIONS

In the period 2006-2015, in Braila county, there were years when the annual rainfall was under the optimum threshold for the development of crops, while the aridity index had values indicating great variations of continental climate degree. The water deficit in soil imposed irrigation utilization, as an absolutely necessary hydro-technical measure under arid and droughty climate conditions specific for Braila county. In the year 2015, over 91% of the county's agricultural area was equipped for irrigations, but the 113 IWUOs had signed contracts to irrigate only 25.6% of the land area equipped with irrgigation facilities.
In the period 2006-2015, the effective utilization of agricultural areas equipped with irrigation systems was maximum 33%, while in the years 2006 and 2010 respectively, the utilization degree was under 15%.
In the investigated period, the grain cereals prevailed in the crop structure, the largest areas being cultivated with wheat, maize, barley and two-row barley; the oil crops followed next, the largest areas being cultivated with sunflower. In all the investigated crops, the average yields per hectare obtained under irrigated system were higher than those obtained under non-irrigated system. It is worth mentioning that in certain crops, namely wheat, barley, maize and sunflower cultivated under non-irrigated system, average yields were obtained in certain years that were higher than the potential yields in the area for the respective crops. At the same time, even under irrigation system, the average yields obtained in wheat, barley. An exception was represented by the average yields obtained in irrigated maize in the years 2011 and 2012, when these exceeded the potential average yield of the area for this crop, as well as the average yields obtained in sunflower, which were higher than the potential average yield of the area for this crop, in the whole analyzed period.

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AUDIT ELECTRONIC (e-AUDIT) TO THE FINANCIAL STATEMENTS

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Abstract

The main aspect to support the creation of good governance is audit (audit) conducted by parties who have independence and have professional competence to check. The implementation of computer-assisted audit has its own impact in the audit procedure because it changes the design of the information system and its internal control structure such as audit trail although it does not in any way alter the general audit concepts and objectives. Implementation of the e_audit system is taken because the Audit Board of the Republic of Indonesia is aware that there is a large gap between the number of inspection entities, audit objects, and stakeholder expectations with resources owned by BPK RI. The development of e-Audit is believed to reduce the gap. The purpose of this study as follows: (1) To analyze the effectiveness of e_audit implementation of financial statements; (2) To analyze the efficiency of the implementation of e_audit to the financial statements in the use of inspection budget.

Key words: *e-audit, audit, budget, effectiveness, efficiency.*

INTRODUCTION

Audit and E_Audit

Broadly speaking, the definition of e-audit is not different from the general audit definition. According to [5] Audit is Collecting and evaluating evidence on information to determine and report the degree of conformity of such information against established criteria. The definition of audit as expressed by Arens, the definition of e-audit is not different only the process of gathering evidence, as well as evaluation of evidence is done with the help of computers. Evidence gathered for evaluation is also no longer a hard copy but a computer data file.

The audit of Local Government Financial Statements (Its called LKPD) is part of public sector audit. Public sector audits differ from audits in the business or private sector [6]. Public sector audits are conducted on non-profit governmental organizations, such as local government (BUMN), state-owned enterprises (BUMN), regional-owned enterprises (BUMN), and other institutions related to the management of state assets.

The main aspect to support the creation of good governance is audit done by party having independence and have professional competence to check. Public sector audit [3] is divided into three types, namely (a) Financial Audit; (b) Audit Performance, and (c) Audit Investigative (Special Audit).

Information technology is a generic term for any technology that helps humans create, transform, store, communicate and / or disseminate information [10].

Computer-based information technology has considerable influence in modern society. Both in the private sector and in government, this information technology helps support daily work. The emergence of integrated web-based business has radically changed not only the way businesses carry out their day-to-day operations, but also the nature of the work done, the nature of business relationships, and how a company's own structure [7]. The more advanced the information technology, the more its influence on the field of accounting. Advances in information technology affect the development of Accounting Information System (SIA) in terms of data processing, internal control, and increasing the number and quality of information in financial reporting.

The implementation of computer-assisted audit has its own impact in the audit procedure because it alters the information system design and internal control structure such as audit trail although it does not in fact alter the general audit concepts and objectives [9].

The Supreme Audit Agency (Its called BPK) of the Republic of Indonesia Representative of East Kalimantan

The Supreme Audit Agency (BPK) has the duty to examine the management and responsibility of state finances in accordance with Article 23 E, F and 23 G of the 1945 Constitution and Law No.15 Year 2004 and Law no. 15 Year 2006, Examination of Local Government Financial Report (its called LKPD) is a type of financial audit conducted by BPK with the aim of giving an opinion statement about the fairness of the information presented in the LKPD [4]

BPK reserves the right to determine the object of the examination, to plan and carry out the examination, to determine the time and method of examination and to prepare and present the inspection report. The authority of BPK should be optimized so that the BPK audit process will get better. The optimization of BPK's authority in order to improve the quality of state financial management and responsibility is realized through an innovation utilizing the progress of information technology namely is "BPK Sinergi". Information technology that supports "BPK Sinergi" is implemented in an information system called e-Audit.

E-Audit is expected to establish a state financial management data center in BPK. Such data centers can be utilized for inspection activities, which results in increased efforts to reduce systematic corruption. Optimizing state and local revenue, as well as improving the efficiency and effectiveness of state and regional expenditures.

The Supreme Audit Agency (BPK) of the Republic of Indonesia Representative of East Kalimantan is one of the representatives who have entered into an agreement with the Regional Government of East Kalimantan, the Regional Government Bank (BPD) of East Kalimantan in terms of access to financial transaction data, It aims to establish a synergistic system between BPK RI Representatives of East Kalimantan, Local Government and BPD East Kalimantan so that all financial management transactions can be accessed for audit information needs.

Information technology used in BPK RI East Kalimantan Representative is expected to be used as a support, must be used as an enabler in supporting performance examination BPK RI East Kalimantan Representative. Therefore, BPK RI East Kalimantan Representative can change its paradigm, authority and responsibility in a focused and measurable way, through technological progress and electronic-based audit to support audit of financial report in BPK RI East Kalimantan Representative as Independent and Independent State Institution.

Decision of Secretary General of Supreme Audit Board Number 245/K/X-XIII.2/5/2012 on Grand Design e-Audit [2] defines e-Audit as a system that establishes synergy between BPK internal information system (e -BPK) with an information system owned by an auditing entity (e-Auditee) through an online data communication between e-BPK and e-Auditee and establishing the State Financial Management and Accountability Center at BPK. E-Audit built by BPK is the manifestation of BPK Synergy which has the following elements: 1) Systems that form the synergy between e-BPK and e- Auditee; 2) Online data communication between e-BPK and e-Auditee; and 3) The data center of state financial management and responsibility is not much different, just the process of gathering evidence, and evalusai proof is done with the help of computer. Evidence gathered for evaluation is also no longer a hard copy but a computer data file.

Decision of Secretary General of Supreme Audit Board Number 245/K/X-XIII.2/5/2012 on Grand Design of e-Audit (2012:17) The e-audit system has several main components, namely: 1) Components of Presentation of Information and Correspondence; 2) Data Center; 3) Consolidator Agent and Master Consolidator Agent; 4) Document Management

The implementation initiative of the e_audit system is pursued because BPK RI is aware that there is a large gap between the number of inspection entities, audit objects, and stakeholder expectations with the resources owned by BPK RI. The development of e-

Audit is believed to reduce the gap. In accordance with the above background, then the purpose of this study as follows: 1) To analyze the effectiveness of e_audit implementation of the financial statements; 2) To analyze the efficiency of the implementation of e_audit to the financial statements in the use of inspection budget.

MATERIALS AND METHODS

This research was conducted at the Supreme Audit Agency (its called BPK) of the Republic of Indonesia - Representative of East Kalimantan Province addressed on Jalan M.Yamin No 19 Samarinda and research orientation on the implementation of e-Audit conducted by BPK RI Representative of East Kalimantan Province.

Details of this research data as follows:

1) Grand Design e-Audit BPK RI [2];
2) Joint decision between BPK RI Representative of East Kalimantan Province with Head of Region;
3) Technical guidance on the development and management of data access information systems for entities;
4) E-Audit Piloting Guide 2012;
5) Realization Budget Audit Report;
6) Follow up of Inspection Result in the number of findings and number of recommendation of result of examination.

This study uses the following analysis tools:

1) Government Regulation Number 249/ PMK.02/2011 on performance measurement and evaluation to measure the efficiency of budget usage; 2) Value for Money Concept Approach to measure the effectiveness of e-audit implementation.

This research is done by using tabulation, graph between effectiveness of financial statement inspection manually with financial examination done electronically.

1) Assessing the effectiveness of e-Audit can use the value for money concept approach, [8]. With this conceptual approach, an e-audit effectiveness assessment can be classified into the categories of effectiveness as presented in Table 1.

2) Assess the efficiency of budget using Government Regulation No. 249/PMK.02/ 2011, on the measurement and performance evaluation.

Table 1. Category of Effectiveness [8]

≥ 100	Effective
90 s.d 100	Quite Effective
< 75 s.d. 89	Less Effective
< 75	Not Effective

Table 2. Efficiency Category [1]

> 90 s.d 100%	Highly Efficient
>80 s.d 90%	Efficient
>60 s.d 80%	Self Efficient
>50 s.d. 60%	Less Efficient
<s.d. 50%	Inefficient

RESULTS AND DISCUSSIONS

This study uses data to assess the effectiveness of the examination, as follows: data (1) number of audit findings and (2) number of recommendation of examination result before and after e-audit.

The data used to assess the efficiency is (3) audit budget realization before and after e-Audit, (4) realization of the volume of Report of the result of examination (Its called LHP) before and after e-audit, (5) realization of budget ceiling for financial report before and after e -Audit and LHP volume targets before and after e-Audit.

1. Assess the effectiveness of e-Audit by using the Value For Money Concept

The analysis used to assess the effectiveness of e-Audit uses a formula comparing outcomes with output [8] where outcome is the number of recommendation of inspection results and the output is the number of examination findings and can be explained in the formula below.

Table 3 explains the percentage comparison of audit effectiveness before e-auditand after e-audit and average percentage comparison, from the table it can be seen that the percentage is still above 100%.

But, there are four regions that decreased the percentage of effectiveness of examination compared with audit manual that is area East Kalimantan Province which decreased by

138.05%, Kutai Kartanegara decreased by 30.05%, Bontang decreased by 22.53%, Paser decreased by 2.30%.

Table 3.Comparison of Percentage of Audit Effectiveness before e-Audit and after e-Audit.

Entities	Average Audit Effectiveness before e_Audit (%)	Categories	Average Audit Effectiveness after_Audit (%)	Categories	Increase/ Decrease	Information
Kalimantan Timur	261.73	Effective	123.68	Effective	-138.05	Decrease
Samarinda	215.00	Effective	253.03	Effective	38.03	Increase
Kutai Kartanegara	318.15	Effective	288.10	Effective	-30.05	Decrease
Balikpapan	175.69	Effective	250.98	Effective	75.29	Increase
Bontang	253.78	Effective	231.25	Effective	-22.53	Decrease
Paser	264.17	Effective	261.87	Effective	-2.30	Decrease
Penajam Paser Utara	246.50	Effective	358.48	Effective	111.98	Increase
Kutai Timur	171.93	Effective	171.93	Effective	0,00	permanent
Kutai Barat	207.12	Effective	269.38	Effective	62.26	Increase
Berau	214.24	Effective	263.69	Effective	49.45	Increase
Total rata-rata	**232.83**	**Effective**	**247.24**	**Effective**	**14.41**	**Increase**

Source: Research Results

Although as many as four regions experienced a decrease in the percentage of effectiveness of inspection, there were five areas which experienced a significant increase. It is about Samarinda City which increased by 38.03%, Balikpapan increased by 75.29%, North Penajam Paser increased by 111.98%, West Kutai increased by 62.26%, Berau district increased by 49.45%.

The increase of the fifth percentage of this area resulted in the average the percentage of effectiveness of examination using e-audit for budget year 2012 and 2013 is 247.24%, while for the audit manual for auditing year 2010 and 2011 the average percentage effectiveness of inspection amounted to 232.83%, increased percentage by 14.41%.

Thus the examination using e-audit is more effective than the audit manual, although manual inspection has been effectively seen from the percentage obtained.

2. Assessing the Efficiency of e-Audit by using the Concept of Government Regulation Number 249/PMK.02/2011

E-Audit efficiency can be assessed from the point of view of budget usage by using government regulation number 249/ PMK.02/ 2011, where efficiency can be obtained through comparison between audit budget realization divided by LHP volume realization compared with budget ceiling realization of report finance divided by volume target.

Table 4. Comparison of Percentage of Efficiency of Budget Usage Inspection before e-Audit and after e-Audit.

Entities	Average Budget Efficiency Before e-Audit (%)	Category	Average Budget Efficiency after e-Audit (%)	Category	Increase / Decrease	Information
Kalimantan Timur	67.16	Enough	90.91	Very Efficient	23.75	Increase
Samarinda	58.70	Less	97.79	Very Efficient	39.10	Increase
Kutai Kartanegara	77.18	Enough	98.37	Very Efficient	21.19	Increase
Balikpapan	72.31	Enough	83.11	Efficient	10.81	Increase
Bontang	78.67	Enough	89.94	Very Efficient	11.28	Increase
Paser	72.98	Enough	75.07	Enough	2.09	Increase
Penajam Paser Utara	70.87	Enough	82.03	Efficient	11.16	Increase
Kutai Timur	82.25	Efficient	95.99	Very Efficient	13.73	Increase
Kutai Barat	68.28	Enough	75.10	Enough	6.81	Increase
Berau	74.57	Enough	73.47	Less	-1.10	Decrease
Total	**72.13**	**Enough**	**86.18**	**Efficient**	**14.05**	**Increase**

Source: Research Results

Table 4 explains the percentage comparison of the efficiency of the use before audit and after e-audit and average percentage comparison, from the table it can be seen that the resulting value is much higher than the percentage of manual audit, there is an increase percentage efficiency in the province East Kalimantan which experienced an increase of 23.75%, Samarinda City increased by 39.10%, Kutai Kartanegara increased by 21.19%.

Almost all regions experienced an increase in efficiency percentage in the use of inspection budget. There was only 1 examination area that use less efficient audit budget that is Berau, decreased the efficiency of the use of inspection budget after using the e-audit system, but overall the use of inspection budget to inspect the area of East Kalimantan Province increased compared to using the audit manual, the total percentage of 86.18% and reached the efficient category.

3. Discussion

Based on the analysis that has been mentioned above, it can be explained that the effectiveness of auditing financial statements by using e-audit reached 247.24% while the effectiveness of audits using the audit manual reached 232.83%, although these two checks have been effectively seen from percentages above 100% but the percentage of overall audit using e-audit has a higher percentage of 14.41% than the audit manual although there are some areas that have decreased the effectiveness of the examination compared to using audit manuals such as Kalimantan Province East, Kabupaten

Kutai Kartanegara, Bontang City, Paser District, but there are five examination areas that obtain a higher percentage by using e-audit, such as Samarinda City, Balikpapan City, North Penajam Paser District, Kutai Barat District, and Berau District.

Overall percentage effectiveness of the implementation of audit of financial statements by using e-audit is higher than the manual audit. Examination of financial statements using e-audits has been effective and more effective than the audit manual.

The results of data processing has been done by using the concept of value for money to assess the effectiveness of audit by e-audit shows that the audit of financial statements using e-audit is efficient.

The analysis undertaken in this paper to assess the effectiveness of the examination by using e-audit and assessing the efficiency of e-audit in order to use the budget examination. The results obtained from the data processing using government regulation no 249 / PMK.02 / 2011 obtained the examination by using e-audit has been efficient with the percentage of 86.18%, while the level of manual audit efficiency is still in enough category with the number of percentage of 72.13% an increase of 14.05% when compared between the audit manual with e-audit, it can be said that the implementation of e-audit in the framework of the use of budget audits of financial statements more efficient than the manual audit, although there are areas that are still less efficient in the implementation of e-audit especially the use of budget examination.

CONCLUSIONS

The results of the analysis using the concept tool of value for money and the Concept of Government Regulation Number 249/ PMK.02 / 2011, then the conclusion of the research as follows:

-Implementation of e-audit in examination of financial statements at BPK RI East Kalimantan Representative has effective with percentage above 100% that is equal to 246.24% while manual of audit equal to 232.83% and a 14.41% increase in percentage compared to the audit manual.

1) The result of analysis shows that the percentage of efficiency of budget usage when executing manual of audit is 72.13% belong to category efficient enough, while percentage of budget usage when executing e-audit equal to 86.18% and classified into efficient category and increase by 14.05%, and it can be concluded that the use of budget when conducting audit is more efficient than audit manual, thereby examining scale more and more detail to produce quality inspection report and findings.

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THE ROLE OF ACTIVATED CARBON IN THE PRODUCTION OF BIOGAS

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Abstract

The research has shown that activated carbon can increase the production of biogas and methane from anaerobic digestion, thereby reducing the startup time. Activated carbon has raised the possibility of microbial resistance to the organic load. A more developed structure of mesoporous the activated carbon was favorable for the colonization of specific bacteria, which leads to increased syntrophic associations between bacteria and methane producers. Thus, the anaerobic reactor complemented with activated carbon would be economically efficient for the production of biogas.

Key words**:** *biogas, activated carbon, substrate, anaerobic bioreactor, membrane concentration, mixture quality*

INTRODUCTION

Efficient use of agricultural wastes - large and important problem of our time. [4] It is related, on the one hand, with the ability to use the vast energy potential of biomass for the production of liquid and gaseous fuel (biogas), on the other - with the need to prevent water pollution, soil contamination by pathogenic bacteria, and helminthes contained in manure runoff of livestock farms. Both of these aspects have been the object of research and experimentation.

Most common method of obtaining energy from biomass - anaerobic (without oxygen) fermentation of agricultural waste [3,6,14]. Obtained as the result products of this process - biogas and fermented semi-liquid mass of the representing a greater value as the gaseous fuel and organic fertilizer. It is equally important aspect of the use of biogas plants - prevention of pollution of air and water pollution, soils and crops through utilization of manure and deodorants large livestock farms and complexes, the production of highly effective organic fertilizers disinfected.

In today's world there is strong interest in the problems of methane fermentation of manure and other organic waste. To construct biogas plants designed for the processing of manure and agricultural waste [8,13]. In addition to the plant itself, which includes the fermentation chamber, gas holder and storage for the fermented mass (slurry), built a pumping station to pump the slurry to the fields and power plant that runs on biogas. Thus biogas preparation (cleaning it from CO_2, H_2S and subsequent compression dehydration with for storage and distribution to customers) using membrane techniques as compared with conventional, such as absorption and adsorption may provide significant economic benefits [8,10,13].

Biogas is produced by anaerobic decomposition of waste, contains methane (≈60% (vol.)) and carbon dioxide (≈40% (vol.)). The gas contains hydrogen sulfide, ammonia, water vapor; its calorific value is low - 19,5-19,8 MJ/m^3. After cleaning and drying gas should contain at least 98% (vol.) CH4 (calorific value of at least 33.0 MJ/m^3) H2S concentration should not exceed (5.3) 4 10% (3.5 million -1). There are several possible options for the process for each of which determine the required membrane surface, the cost of compression, the degree of extraction of methane from the feed mixture under different conditions (pressure, number of stages and the degree of separation in recycling schemes recycle) [5,9,16].

This paper presents the results of studies on the addition of the activated carbon with different pore sizes in the anaerobic reactor. Reactor productivity and methane were determined.

MATERIALS AND METHODS

The paper used the classical and modern physical and chemical methods of research; you always get the full characteristics of the objects of research.

Cultivation of anaerobic methanogenic conditions. Methanogenic bacteria - strict anaerobes, the growth of their possible during the initial a redox potential of the environment below - 300 mV. The temperature optimum for the growth of the mesophilic - in the region 30-40°, with the optimum pH in the region 6.5-7.5.

Waste analysis: content of carbon and nitrogen. Organic and inorganic part of the waste was analyzed separately by various methods. Since the process of anaerobic digestion are involved in mainly organic waste, then, in terms of biotechnology, more efficient to operate the process only with their participation.

Branch inorganic waste component carried by calcinations in a muffle furnace at a temperature of - 350 ^{0}C. The inorganic part is determined only by the contents of N, Ca, K, Na, P, Mg, Fe, etc, the most important elements for feeding the microorganisms according to [1, 12]. Elemental composition of the organic part to the carbon and nitrogen content was determined using a mass spectrometer as described in [7,17]. Fraction content (water-soluble compounds, which are soluble in alcohol, protein, hemicelluloses, cellulose, lignin, ash) was determined as described in [15].

RESULTS AND DISCUSSIONS

Parameters of the porous structure of the modified activated carbon obtained by thermal activation are shown in Figure 1. Raising the temperature from 573 K to 773 K leads to poor development of the porous structure, wherein the total pore volume is from 3.8 to $5.0 \cdot 10^{-4}$ m^3/kg. Increased activation temperature from 873 K to 973 K is accompanied by increased pore volume to a maximum value ($8.5 \div 11.0 \cdot 10^{-4}$) m^3/kg. A further increase in temperature from 1,073K to 1,273K do adversely affects the quality of the activated carbon, as hydrocarbons contained resin and decompose to form inactive carbon deposited on the surface of the coal and also leads to sintering pore.

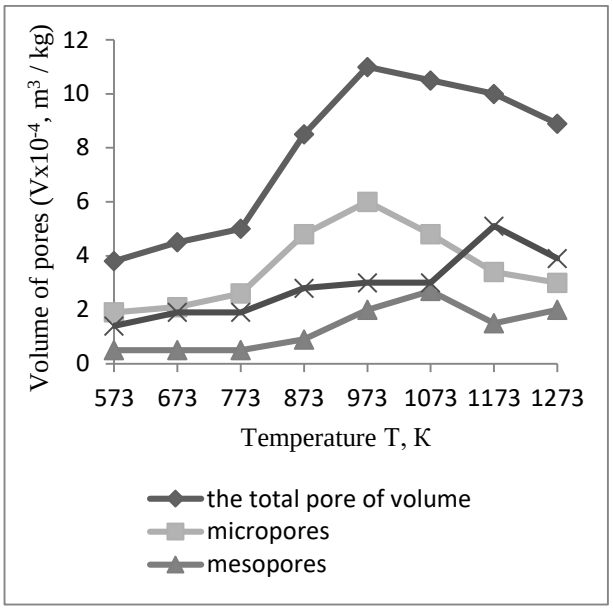

Fig.1. Effect of heat activation temperature in a stream of CO_2 at a pore volume of bones of the shell

The experimental results show the effectiveness of the thermal treatment of the shell of apricot stones, which have a large volume of micropores and moderately advanced transition porosity provides an intense diffusion of the adsorbate into the adsorbent grains.

The process of chemical activation adsorbent of natural origin - one of the important processes of high quality activated carbons used in various sectors of the economy. It is known that in the case of adsorption of substances from solutions to large molecules, which practically inaccessible micropores is the main importance of transition pore surface. In this regard, the study features a chemically-activated shell apricot kernel is the aim of this part of the work and the conditions for the further studies of their use in the production of biogas.

The parameters of porous structure the shell of apricot stones activated zinc chloride ($ZnCl_2$) with impregnation ratio 0.2; 0.3; 0.4; 0.5; 0.6, followed by activation in a quartz furnace in an atmosphere of carbon dioxide (CO_2) at temperatures from 573 K to 873 K are shown in Figure 2. The figure shows the same as in

the previous example, with the increase in the coefficient of impregnation of 0.2 to 0.4 is the development of coal porosity, and at the expense of increasing the total pore volume of $6.8 \cdot 10^{-4}$ m^3/kg to $12.0 \cdot 10^{-4}$ m^3/kg.

If the value of the coefficient of impregnation of 0.5 to 0.6 decreases the volume of micropores of $4.0 \cdot 10^{-4}$ m^3/kg to $3.0 \cdot 10^{-4}$ m^3/kg and the volume of mesopores $5.5 \cdot 10^{-4}$ m^3/kg to 5.0 10^{-4} m^3/kg and the development of macro porosity begins from $1.5 \cdot 10^{-4}$ m^3/kg to $2.0 \cdot 10^{-4}$ m^3/kg. When the impregnation ratio of 0.4 increase in temperature from 573 K to 773 K leads to a significant development of the porous structure (the total pore volume of from $7.0 \cdot 10^{-4}$ m^3/kg to $12.0 \cdot 10^{-4}$ m^3/kg). Further increase in temperature to 873 K adversely affect the pore structure, which reduces the volume of the micropores of $4.2 \cdot 10^{-4}$ m^3/kg to $4.0 \cdot 10^{-4}$ m^3/kg and a mesopore volume of $6.5 \cdot 10^{-4}$ m^3/kg to $5.7 \cdot 10^{-4}$ m^3/kg.

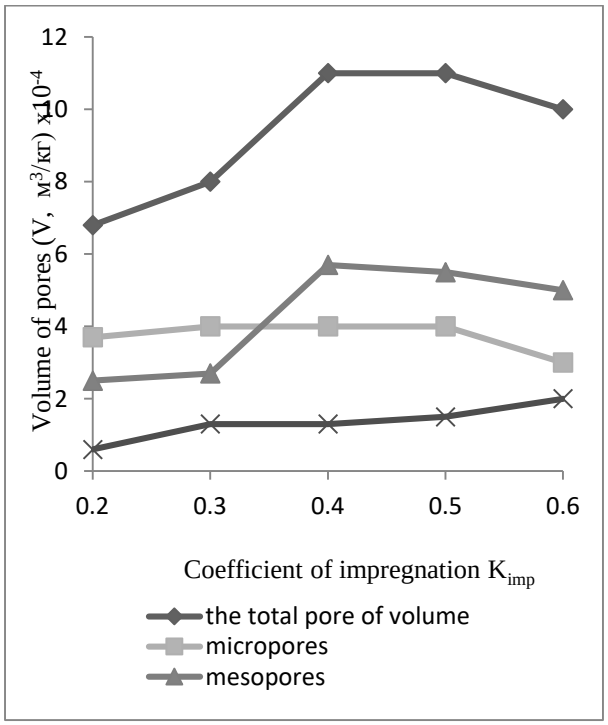

Fig. 2. Effect of the coefficient of impregnation of zinc chloride ($ZnCl_2$) followed by activation in a quartz furnace in an atmosphere of carbon dioxide (CO_2) on the pore volume of the shell bones

For samples treated of $ZnCl_2$, optimal parameters of activation modes are: infiltration coefficient – 0.4; time - 3 hours. For samples treated with $ZnCl_2$ followed by activation with CO_2 optimum parameters are: CO2 temperature - 773 K; impregnation ratio of 0.4. Modifying the surface of the sample affects the change in pore spaces, which essentially depends on the adsorption capacity of activated carbon. This requires the severity of an individual approach to each sorbent with the obligatory account of its structure, effectively defining the size and shape of the pores. The transitional pore adsorbents at high relative pressures phase transition occurs through the mechanism of capillary condensation.

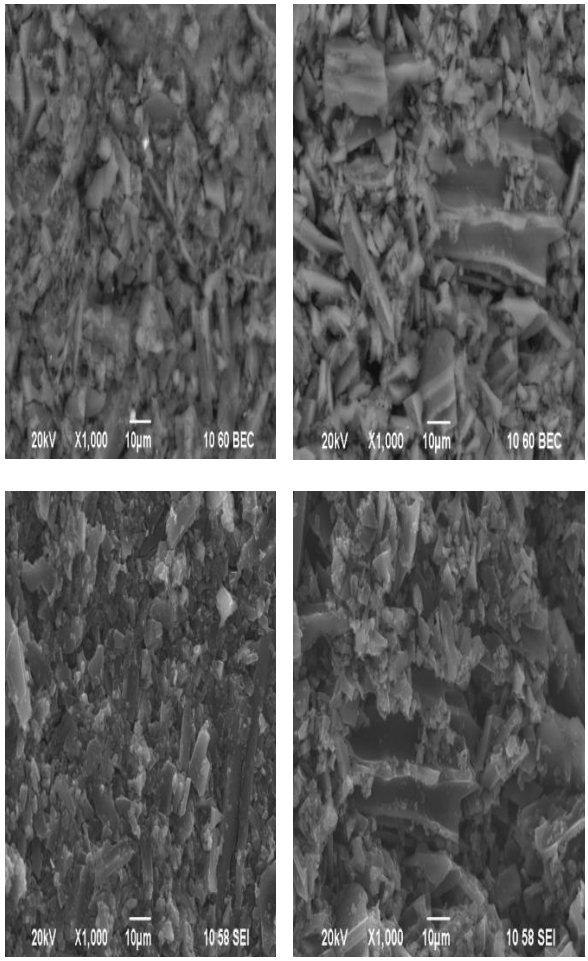

Photo 1. Microorganisms attached to the activated carbon was observed by a scanning electron microscope (JSM-6490LV).

The above results show that adding the activated carbon, a high level of methane production was observed in the anaerobic reactor with natural microorganisms. Increased productivity can be attributed to an increase in the microbial population producents of methane bacteria and syntrophic bacterial metabolism. The absorbed microorganisms

that have a high level of metabolic capacity have increased pores of AC. It has been found that activated carbon showed extensive colonization within the porous structure. Activated charcoal ensures the development of mesoporous structure for the methane producers that use bacteria to colonize.

CONCLUSIONS

The obtained complex structural and adsorption data indicate that the samples chemically activated seed shells on the physical and chemical adsorption, and structural characteristics are not inferior to the applicable industrial activated coals and will be able to find a practical application as adsorbents in obtaining biogas. Thanks to advanced (transition) mesoporosity and a large specific surface area is effectively large-scale colonization of micro-organisms for which the micropores are practically inaccessible.

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RESEARCH ON THE LAMB AND MUTTON MARKET IN THE EUROPEAN UNION

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Abstract

This research has surprised the evolution of the lamb and mutton market in the European Union during 2011-2016. In this research, reference has been made to the evolution of this market for the period 2018-2025. In order to carry out the present research, a number of representative indicators for the lamb & mutton market were analyzed. Of the specific indicators of this market we mention: the sheep flocks in the European Union; the production of lamb & mutton; total consumption of lamb & mutton; net exports of lamb & mutton, etc. The indicators analyzed have evolved differently from one year to the next in the European Union. In terms of meat consumption in the European Union, the first place is the pork, with over 39 kg / inhabitant. On the opposite side we find the consumption of lamb & mutton, with over 2.5 kg / inhabitant. A less beneficial aspect for the lamb & mutton market is that, at EU level, imports of lamb & mutton are clearly superior to exports. In this research we used statistical data taken from international specialized sites.

Key words**:** *lamb and mutton, market, European Union; meat production, prices*

INTRODUCTION

Concerning the sheep breeding, a significant aspect is represented by the fact that the sheep have the lowest risk of contamination with antibiotic residues. In the spring, sheep have the most tender and lowest fat meat. Sheep meat contains a range of proteins that are easily absorbed by the body.
Along with these proteins in sheep, we find vitamins B [6,8].
Lamb meat is a significant source of protein. If 100 g of lamb is consumed, 60% of the daily protein requirement for the body is provided. Lamb has a high mineral content. Iron, zinc and selenium have a major importance for the health of the population. Only 100 g of lamb contains the following: 40% of the daily zinc requirement and 50% of the body's need for selenium [5].
In Europe, the UK ranks first in terms of sheep meat production. It is followed in this ranking at a considerable distance by: Spain, France, Greece, Ireland, Italy and Germany [11].
According to some specialized studies published on the market, it is shown that in the European Union the most consumed meat is pork, with over 39 kg / inhabitant. In the top of meat consumption we find: poultry meat over 24 kg / inhabitant; beef with over 16 kg / inhabitant and far away sheep and lamb meat with over 2.5 kg / inhabitant.
The most significant consumption of sheep meat is found in Western Europe, especially France and the United Kingdom [1,9,14].

MATERIALS AND METHODS

In order to accomplish the present research, a series of statistical data related to the European Union were processed and analyzed, such as sheep flocks; the production of lamb & mutton, total consumption of lamb & mutton, consumption of lamb & mutton per locator, selling prices, sheep exports and net exports of lamb & mutton.
The data required for the present research, resulted from the consultation of specialty materials. Statistical data has been retrieved from various international sites.

RESULTS AND DISCUSSIONS

Sheep flocks in the European Union recorded fluctuations from year to year during 2011-

2016 (Fig.1). In 2011, was registered the largest number of sheep at EU level, ie 98.6 million heads. At the opposite end, the smallest flock was recorded in 2016 (85.7 million heads).

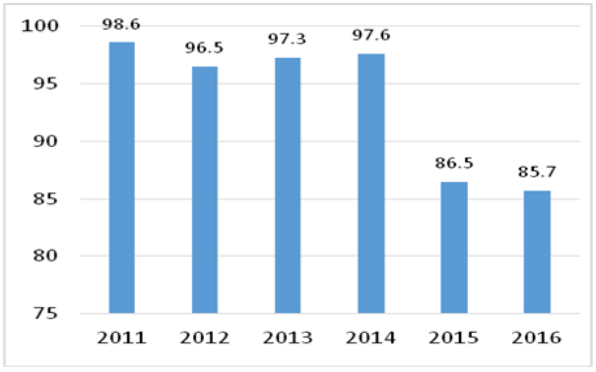

Fig. 1. Sheep flocks in the European Union for the period 2011-2016 (millions heads)
Source: [3,10,12]

From the data published by Eurostat in 2016, in the European Union the largest sheep flocks were registered in the following countries: United Kingdom (23,819 thousand heads), Spain (15,962.89 thousand heads), Romania (9,875 thousand heads), Greece (8,730 thousand heads), Italy (7,284 thousand heads) and France (7,157 thousand heads) (Fig. 2).

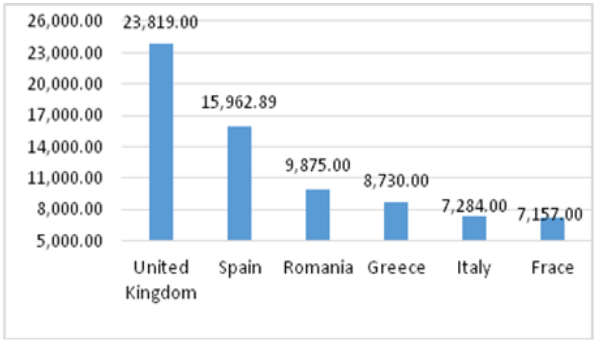

Fig. 2. The top of the first sheep-breeding countries in the European Union in 2016 (thousand heads)
Source:[2]

Also, in 2016, the smallest sheep flocks were registered in countries such as: Austria (378.38 thousand heads); Slovakia (368.90 thousand heads); Lithuania (163.60 thousand heads); Latvia (106.63 thousand heads) and Malta (11.52 thousand heads) (Fig. 3).

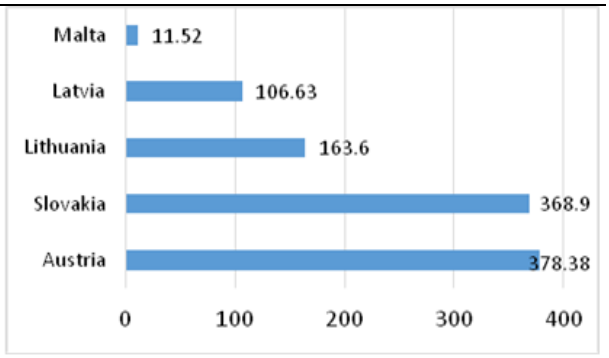

Fig. 3. Top of the countries with the smallest sheep population in the European Union in 2016 (thousand heads)
Source: [2]

The production of lamb & mutton in the European Union during the analyzed period recorded a growing trend. The smallest production was achieved in 2011 (1,032.09 thousand tons), and the largest production was recorded in 2016 (1,053.64 thousand tons). The data show an increase in the production of lamb & mutton by 2.08% in 2016, compared to 2011 (Fig. 4).

According to official data published for the year 2016, the sheep meat production in the European Union was obtained as follows: United Kingdom (33%); Spain (22%); France (10%), etc.

Regarding the degree of self-sufficiency with sheep meat at the level of the European Union during the analyzed period it was the following: 84% (2011); 87% (2012); 87% (2013); 88% (2014); 86% (2015) and 88% (2016) [3,4].

Fig.4. The production of lamb & mutton in the European Union during 2011-2016 (thousands tons)
Source: [4]

Concerning the production of lamb & mutton in the European Union, for the period 2018-2025, an upward trend is expected (Fig.5). For

the year 2025, a production of 1,068.26 thousand tons is expected, which represents a growth of 1.38% compared to 2016.

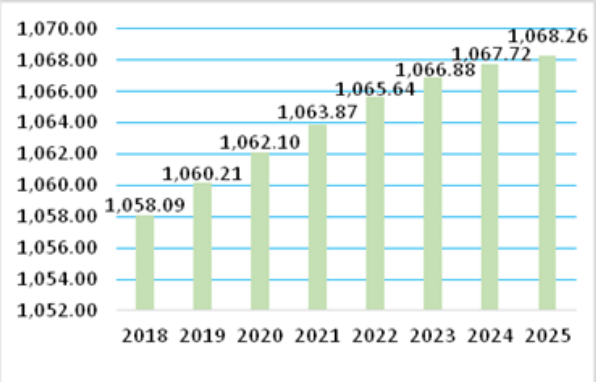

Fig.5. Forecasts for the production of lamb & mutton in the European Union in the period 2018-2025 (thousand tons)
Source: [4]

The total consumption of lamb and mutton in the European Union during 2011-2016 was determined by several factors, including: consumer preferences; the price for this category of meat; traditions, etc. From the official data presented, it is observed that at the community level there was an increasing trend. The highest consumption was registered in 2016 (1,337.11 thousand tons), and the lowest consumption was of 1,296.98 thousand tons (2011) (Fig.6). In 2016, the total consumption of lamb & mutton in the European Union increased by 3.09% compared to 2011.

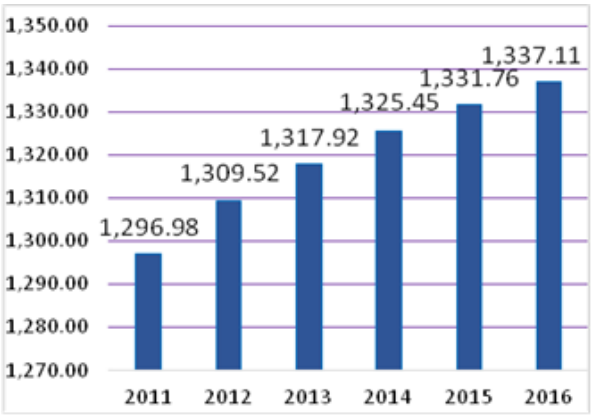

Fig.6. Total consumption of lamb & mutton in the European Union, 2011-2016 (thousand tons)
Source: [4]

According to the data regarding the total consumption of lamb and mutton in the European Union for the period 2018-2025, there is an increasing trend (Fig.7). The highest total consumption of lamb & mutton meat will be recorded in 2025 (1,381.12 thousand tons). In 2025, total lamb and sheep meat consumption will increase by 3.29% compared to 2016.

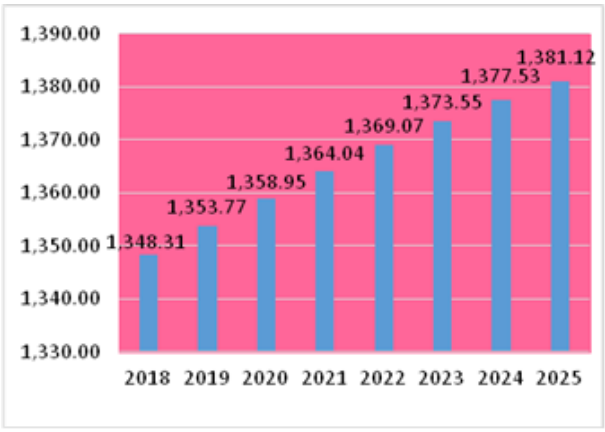

Fig.7. Forecasts for the total consumption of lamb and mutton in the European Union in the period 2018-2025 (thousand tons)
Source: [4]

The consumption per capita of lamb & mutton in the European Union ranged between 2.59 kg/ inhabitant and 2.65 kg/ inhabitant during 2011-2016 (Fig.8). In 2016, the consumption of lamb & mutton per capita increased by 2.31% compared to 2011.

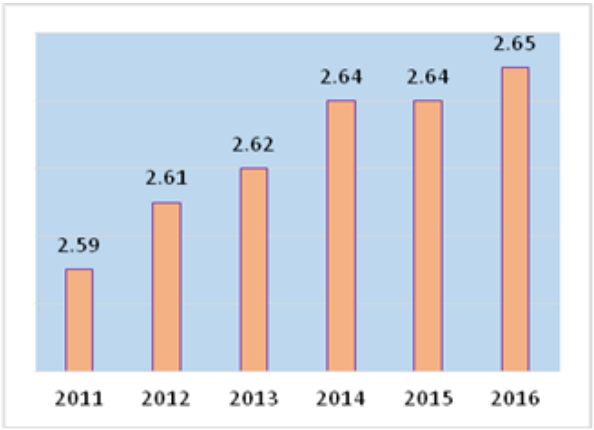

Fig.8. Consumption per capita of lamb & mutton in the European Union, in the period 2011-2016 (kg/ inhabitant)
Source: [4]

For the 2018-2015 period, an increase in the consumption per capita of lamb and sheep is expected, from 2.67 kg / inhabitant (2018) to 2.72 kg / inhabitant (2025) (Fig.9). In 2025,

lamb and sheep consumption will increase by 1.87 compared with 2016.

Fig. 9. Estimates of consumption of lamb & mutton per capita in the European Union in the period 2018-2025 (kg / inhabitant)
Source: [4]

According to official data published by Eurostat, in the EU's main sheep-breeding countries in the analyzed period, sales prices fluctuated from one year to the next. In 2016, a sales price of EUR 672.3 per 100 kg of live weight was recorded in France. This price was the highest of all the prices in the main European Union sheep breeding countries.
The lowest prices were recorded in Romania (87.74 EUR per 100 kg live weight) and in Spain (52.8 EUR per 100 kg live weight).

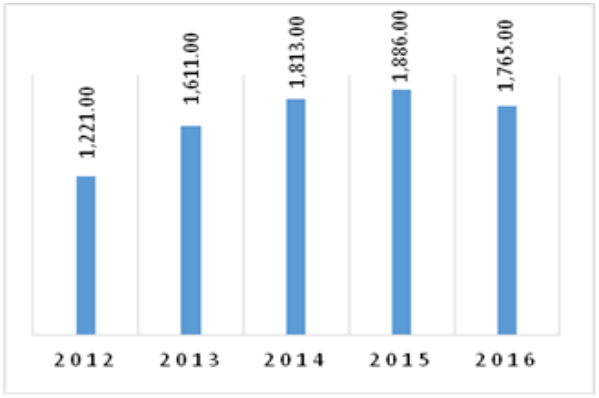

Fig.10. Export of sheep in the European Union, 2012-2016 (thousands of heads)
Source: [10]

The export of sheep in the period 2012-2016 varied from one year to the next. In 2015, the European Union exported the largest number of sheep (1,886 thousand heads), and the smallest sheep export was 1,221 thousand heads (2012) (Fig.10) [10].

A negative contribution to the EU economy had its net exports of sheep and lamb meat during 2011-2016. During the analyzed period there is a major imbalance between imports and exports of sheep and lamb meat. [8]
During this period, the quantitative imports of sheep and lamb have outpaced the quantitative exports. Net exports for this meat category varied between 2011 (-264.89 thousand tonnes) and 2016 (-283.47 thousand tonnes) (Fig.11).
At the level of 2015, European Union exports of sheep were 61,000 tonnes, of which half were live animals [12].
In 2016, the world's main exporters of meat and sheep and goat meat products were: New Zealand; Australia; European Union; India; Uruguay; United States, etc.
From the data presented, it can easily be noticed that the European Union ranks third among the world's largest exporters for meat and sheep and goat meat products.
The world's leading importers of meat and sheep and goat meat products for the year 2016 were: China and Hong Kong, European Union, United States, Malaysia, Japan, etc [4].

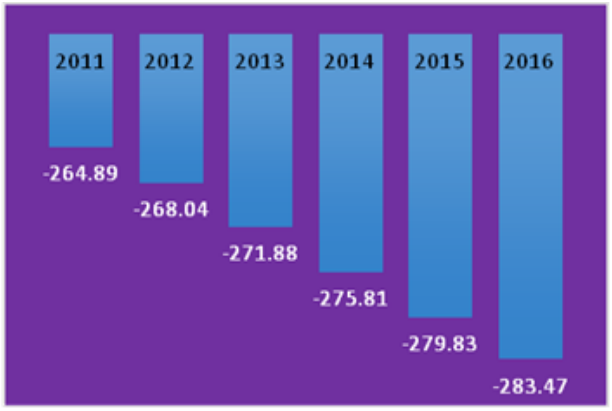

Fig.11. Net exports of lamb & mutton in the European Union, 2011-2016 (thousand tons)
Source: [4]

For the 2018-2025 period, a negative trend for the net exports of lamb & mutton is foreseen at the EU level (Fig. 12).
Currently, in the European Union, the sheep meat production and marketing sector is a fragile sector. In this context, it is necessary to adopt a strategy that envisages an active policy for the production of sheep meat for a longer period. This strategy is vital, especially for the

better capitalization and conservation of land at the level of the European Union [7].

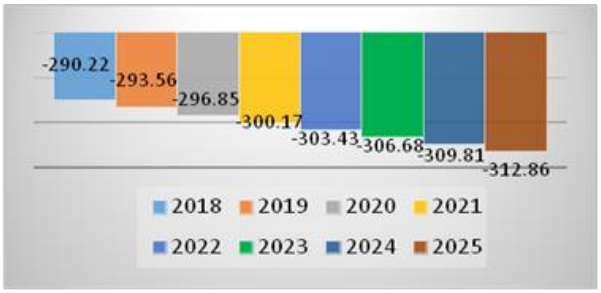

Fig.12. Forecasts of net exports of lamb & mutton in the European Union in the period 2018-2025 (thousand tons)
Source: [4,12]

CONCLUSIONS

Following the analysis of the lamb and mutton market at the European Union level, we can see the following:

-the largest sheep flock in the European Union in the analyzed period was recorded in 2011 (98.6 million heads);

-the largest herds of sheep registered in 2016, were in: United Kingdom; Spain; Romania; Greece; Italy and France;

-the largest production of lamb & mutton was 1,053.64 thousand tons (2016);

-the highest total consumption of lamb & mutton was 1,337.11 thousand tons (2016), and the lowest consumption was 1,296.98 thousand tons (2011);

-the consumption per capita of lamb & mutton increased in 2016, by 2.31% compared to 2011;

-In 2016, France recorded the highest sale price for sheep (672.3 EUR per 100 kilograms live weight), of the main sheep-breeding countries;

-in terms of sheep export, in 2015 was recorded the most significant export (1,886 thousand heads);

-In 2011-2016, at EU level, the imports of lamb & mutton were superior to exports.

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A STUDY ABOUT THE PEST INSECTS IN THE APPLE TREES ORCHARDS, WITH LOCAL SORTS, SPECIFIC TO SIBIEL VILLAGE (SIBIU COUNTY), IN THE CONDITIONS OF THE YEARS 2015-2016

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Abstract

The presented research developed during the period between the years 2015-2016 in an apple trees orchard in the Sibiel village (Sibiu county). The purpose of the study was the identification of the entomofauna in the studied agroecosystem, the establishing of the pest attack gravity, the estimation of the pest and the suggestion of solutions. They were applied the following research methods: the direct observation on plant, the collecting of the entomological material and the attacked organs of the plants, the using of the entomological glass and the using of the photography. The application of the integrate protection and the using of the measures and means for prevention and curative treatments against the pest, on could help to obtain an important result, that represent the number one technological factor in the fruit-trees growing practice.

***Key words*:** *apple trees orchards, pest fauna, Sibiel village*

INTRODUCTION

At the insect's populations level (and not only), the analysis of the demographical, genetical aspects or about their protection and conservation are limited by the absence of information about the movement methods that play an essential role in the establishing of the local extinction rate and the estimation of the effective dimension of the population [16]. The individuals move in a biotope for many reasons: food, reproduction, avoiding the enemies, or for better conditions of life. All these moments have a deep influence on the surviving and the reproduction rate.

The apple trees need a permanent attention to obtain a good harvest and fruit quality.

Without care and attention some apple trees could prematurely die.

It could be frustrating when the fruits harvest is destroyed because of the presence of the diseases or pests.

For rehabilitation and for a vigorous orchard it is needed to know and evaluate its phytosanitary situation [6,8,15]. Only after the establishing the answers one can make a realistic evaluation that could determine if the rehabilitation of the orchard will be useful to obtain a good fruit production.

In the agroecosystems, the man altered the trophic relations between the populations, favouring autotrophic producers (the cultivated plant), and limiting the consuming and unnecessary autotrophic producers to man. The knowledge of the entomological biodiversity and its biological characteristics, is a very important information for decision-making and plant protection policy based on the scientific research.

The systematic studies are the basis for the knowledge of the biodiversity and comprise the discovery and description of the species, then their monitoring, attack measurement and damage assessment.

The application of the integrate protection and the using of the measures and means for prevention and curative treatments against the pest, on could help to obtain an important result, that represent the number one technological factor in the fruit-trees growing practice.

The similar studies were made by myself in the Sibiel village, but in the other years [7,9, 11-14].

Also, the studies about the pests in the apple trees orchards were effected in the Sibiu county by.

The purpose of the paper is the identification of the entomofauna in the studied agroecosystem, establishing the pest attack gravity, in order to issue solutions for improving the health of apple tree orchards in Sibiel Village.

MATERIALS AND METHODS

The presented stydy about the fauna in the apple trees orchard in the Sibiel village (Sibiu county) was made in the conditions of the years 2015-2016.

In order to study the entomofauna in the proposed agroecosystem, there were used the following methods in orchard: the direct observation on plants, the collection of the entomological material and also the attacked organs of the plants, the use of the entomological glass and the using of the photography.

The captured entomofauna by means of the entomological glass was identified in laboratory. It was used the magnifying glass IOR 1983 and IPM Scope.

To analyse the apple trees orchard from phytosanitary point of view, and for the formulation of the final conclusions about the orchard situation there were necessary the periodical inspections both during the vegetative period and in the vegetative repose.

In the period between the years 2015-2016, there were made some investigations in the farm to monitorize the pest agents or their attacks on the plant organs. In this period there were identified the pest factors, there were collected samples for a further identification, it was made the analysis of the soil, the evaluation of the damages and a proposal of the measures complex as efficient solutions in order to extend the age for using those trees.

In order to find out the biological reserve of the trees by the coming winter, there were made tests on the surface of the leavel, fruits, branches, trunks and in soil [1-4].

It was used the notion of "the attaking degree" (GA) in order to frame the attack produced by phytopatogenous agents (deseases) depending on frequency and intensity (force).

GA% is the expression of the extension of the attack gravity on the culture, or the total number of plants which were analyzed.

$$GA\% = \frac{F \times I}{100}$$

where: F is the frequency of the attack, i.e. the relative value of the number of plants or plants organs (n) attacked reported to the number of plants or plants organs studies (N);

$$F\% = \frac{n \times 100}{N}$$

I is a relative value which reflects the covering degree or the extinction of the attack on plant, reporting the attacked surface to the total surface observed.

It was used the noting class 6.

$$I = \frac{\sum (i \times f)}{n}$$

i – the note or the percentage of the covering attack;

f- number of attack cases at every note;

n –total number of attack cases.

RESULTS AND DISCUSSIONS

In our country they are known about 12-15 species of pests which could compromise the production of the apple trees even 100% in case they are not under control.

The village Sibiel lies at 22 km distance from Sibiu, and it is a part of the microregion "Mărginimea Sibiului".

The studied orchard is placed at the entrance in the village Sibiel just on the Sibiu-Sibiel Road (Photo 1).

Photo 1. The apple trees orchard in the Sibiel village (Sibiu county)

The plot surface is of 1,200 m^2. The sorts of the apples cultivated in the orchard are: Jonathan, Starkrimson, Red Melba, Wagner premiat. The trees are distributed in the trees rows, with a total of the 36 aplee trees.

For a complex study, the orchard was visited recurrently in order to monitorize the pests and for the identification of the attack manner on different organs of the fruitbearing trees.

The principal species representing the object of the present study belong to the Insect Class.

The insects are represented by 3 Orders: **Homoptera** with 3 species (*Aphis pomi*, *Quadraspidiosus perniciosus*, *Eriosoma lanigerum*), **Coleoptera** with 2 species (*Anthonomus pomorum*, *Scolytus mali*), and **Lepidoptera** with 2 species (*Operophtera brumata*, *Adoxophyes reticulana*). Another study about the lepidoptera species in the apples trees orchard were made in the years 2014, and 2016 [8,10,12].

By the manner of attack, damages, and by the value of the attack degree, this pest fauna could cause serious damages to the orchard.

Homoptera Order, *Aphididae* Family

***Aphis pomi* De Geer** (the green couse of the apple) (Photo 2).

Poliphagous species attack mainly the apple tree.

The louses fixed themself on the inferior surface of the leaves from the top of the offshoots.

The pricked leaves, twist, turn yellow and dry them.

Photo 2. *Aphis pomi* De Geer (the green couse of the apple)
https://www.google.ro/search?q=Aphis+pomi+De+Geer

The frequence of attack is weak, but was present to all sorts of apples in oechard. The attack degree (G.A.) is milddle.

***Diaspididae* Family**

***Quadraspidiosus perniciosus* Comst.** (the San José louse), (Photo 3)

Photo 3. *Quadraspidiosus perniciosus Comst*.
https://www.google.ro/search?q=Quadraspidiotus+perniciosus

It is an eurimer species, on localized on all plant organs, prefering the wooden parts.The attack degree has a milddle value on all the cultivated sorts, except the Jonathan sort.

***Schizoneuridae* Family**

***Eriosoma lanigerum* Hansm** (woolen louse), (Photo 4)

The attack on manifest itself on the trunks and branches in form of swellings. During the timee, the trees dry. The louses colonies are obvious because of the waxen secretions of withe colour that cover the colonie.

The attack degree of the woolen louse is extremely powerful on the sorts: Starkrimson, Wagner premiat, Jonathan.

Photo 4. *Eriosoma lanigerum* Hansm.
https://www.google.ro/search?q=Eriosoma+lanigerum

Coleoptera Order

***Curculionidae* Family**

***Anthonomus pomorum* L.** (Apple tree flower pest), (Photo 5)

It attacks preferentially the aplles tree. The attack degree is extremely powerful, mainly to the Jonathan sorts and Golden that present antonomate flowers (in from of cloves). Because the attack degree was extremely powerful, the fruits were too litlle, near absent.

Photo 5. *Anthonomus pomorum* L. [4]

The aplee trees that belong to the sorts: Starkrimson, Wagner Premiat, Red Melba didn't have flowers.

***Curculionidae* Family**

***Scolytus mali* Becht.** (the big apple pest), (Photo 6)

The pest is poliphagous, and it is also on apple tree. At the powerful attack, the caterpillars could distroy all the leaves mass. This species was identify on all sorts of apples cultivated in the orchard. The attack degree was milddle.

Photo 6. *Scolytus mali* Becht. (the big apple pest), [4]

Lepidoptera Order

***Operophtera brumata* L.** (Big apple tree pest), (Photo 7)

The pest is polyphagous, but it is also encountered on the apple. On strong attack the caterpillars can destroy the foliage of the tree entirely. This species have been identified on all varieties of apple cultivated in the orchard. The attack degre was scored by the middle attack.

Photo 7. *Operophtera brumata* L. (Big apple tree) https://www.google.ro/search?q=Operophtera+brumata

***Tortricidae* Family**

***Adoxophyes reticulana* Hb.** (fruit skin pest), (Photo 8)

This is a poliphagous species, and there is also on apple tree. They were observed some larvas that attacked the leaves of the trees, twisted them in form of a cornet [10].

When the fruits are ripe (mature), they could gnaw at their epicarp (skin) producing qualitative damages.

Photo 8**.** *Adoxophyes reticulana* Hb. (fruit skin) https://www.google.ro/search?q=Adoxophyes+reticulana

The attack degree in the orchard is a middle one for all apples sorts.

The pest degree of the fruit-bearer trees vary in general from moderate to extremely powerful.

CONCLUSIONS

Among the 7 identified species during the period between 2015–2016, the species with the most damage degree were: *Eriosoma lanigerum* Hansm., *Anthonomus pomorum* L. In the category with a middle damage degree

are: *Aphis pomi* De Geer, *Quadraspidiosus perniciosus* Comst., *Operophtera brumata* L., *Panonychus ulmi* Koch. The species *Quadraspidiosus perniciosus* were considered as a quarantine species not a long time ago, because a powerful attack could determine the quantitative and qualitative diminuation of the fruits production [10], but also the orchard drying only in a few years. The species with the smallest attack degree is *Scolytus mali* Becht. The Jonathan is the most attacked apple sort. On it there were identified almost all the pests present in the orchard.

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RESEARCHES ON THE MYRMECOFILE SPECIES OF LYCAENIDA FAMILY COLLECTED FROM GRASSLANDS AROUND SIBIEL, SIBIU

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Abstract

This study refers to Lycaenidae family, owned mirmecofile species. The pupose of the paper was to characterize the habitat feeding preferences of this butterfly species, especially for mirmecofile species. Butterflies respond rapidly to environmental changes and are important indicators of the health of biodievrsity and the wider environment. A study of the diurnal Lepidoptera (Rhopalocera) populations was based on foirld survey method and completed in the meadows cut for hay around the village of Sibiel, located 22 km from Sibiu, central Romania. This study has generated an important new baseline on the status of butterflies in the region, specifying which are the mirmecofile species. Of the 59 species of Macrolepidopters collected in 2015, there were identified 7 myrmecofile species belonging to the Lycaenidae Family as follows: Satyrium spini spini, Satyrium acaciae acacia, Plebeius argus argus, Plebeius argyrognomon argyrognomon, Aricia agestis agestis, Polyommatus icarus icarus, and *Polyommatus daphnis daphnis.*

***Key words*:** *faunistics, ecology, Macrolepidoptera, Sibiel*

INTRODUCTION

Researches on the mutual relations between butterflies and ants, most notably the butterflies of the genus *Maculinea*, where the larvae have evolved into social parasites, obligatory *Myrmica* antimykofili [35].
In the case of mutualist butterfly larvae, the basis of the mirmecofile relationship is to provide a source of food in exchange for protection. Ants of the host species bring the larvae into the colony, where they grow up to the hump.
In the *Maculinea* cucumber (*M. alcon, M. rebeli*) the larvae are nourished and fed by the hosts, and in the predatory species (*M. arion, M. nausithous, M. teleius*) they feed on eating larvae and eggs ants [36].
Such mutualist relations have formed between Lycaenidae butterflies larvae and ants throughout their evolution.
The mutual relationship between butterfly and antler larvae is to protect larvae against various parasites and predators.
Ants are rewarded by larvae with a rich amino acid secretion.

MATERIALS AND METHODS

The study of lepidoptera in Transylvania has a long history [1-9, 10-33, 36, 37].
The collection sites were located in Sibiel grassland, over the periode April to October 2015 [34]. Search were made throughout this period, with more intensive effort during the summer months.
The grassland habitat in the village of Sibiel [27, 32-35] was chosen in which the butterfly species of the Lycaenidae family live on plants from the spontaneous flora.
The aim of the paper was to characterize the habitat feeding preferences of Lycaenidae butterflies species, specifying which of these are mirmecofile species.

RESULTS AND DISCUSSIONS

The Lycaenidae family contains more than 5,000 species of butterflies, of which over 75% have a certain relationship with different species of ants. Much of these relationships are mutualistic, optional or mandatory. In the optional relationship, larvae offer saccharine to

ants in exchange for protection against predators and parasites.

The collection sites were located in Sibiel grassland, over the periode April to October 2015. Search were made throughout this period, with more intensive effort during the summer months. Specific survey areas where specimens were collected included: North Sibiel village: Valea Cetății, Calea Nouă, Schit Sibiel, Colibi, Gura Morii, in the South-East: Bărcul Roșu, Subpărățel Forest, Luncă, Vadul, in the South-West: grassland Vii, Locuri Rele [34].

Family Lycaenidae

Satyrium spini spini ([Denis&Schiffermüller], 1775)) (Photo 1)

Habitat type(s): bush area, forest edges, sylvan glades. **Status***:* localized and rare. **Altitude**: 100-800 m. **Flight period**: VI-VII. **Protection status**: near threatened. **Larval food plants**: *Rhamnus catharticus, Paliurus spina-christi*. Myrmecophile species. **Overwintering stage:** egg.

Photo 1. *Satyrium spini spini*
https://www.google.ro/search?q=Satyrium+spini+spini

Satyrium acaciae acacia (Fabricius, 1787) (Photo 2)

Habitat type(s): oak forests, forest edges, karst areas, wooded steppe, limestone gorges.

Photo 2. *Satyrium acaciae acacia*
https://www.google.ro/search?q=Satyrium+acaciae+acacia

Status*:* localized, common and very common. **Altitude**: 0-800 m. **Flight period**: mid V-mid VII. **Protection status**: endangered, vulnerable and near threatened. **Larval food plants**: *Prunus spinosa*. Myrmecophile species. **Overwintering stage:** egg.

Plebeius argus argus (Linnaeus, 1758), (Photo 3)

Habitat type(s): found in all habitat types [9,34].

Status*:* common and very common. **Altitude**: 0-1600 m. **Flight period**: mid V- mid VI (G1), mid VII-VIII. **Protection status**: Least concern. **Larval food plants**: *Hippocrepis comosa, Lotus corniculatus*, Coronilla varia, *Cytisus sp., Helianthemum sp., Genista sp., Colutea sp., Astragalus sp., Ononis sp., Medicago sp., Galega sp., Erica sp., Calluna vulgaris*. Myrmecophile species. **Overwintering stage:** egg.

Photo 3. *Plebeius argus argus*
https://www.google.ro/search?q=Plebeius+argus+argus

Plebeius argyrognomon argyrognomon (Bergsträsser, 1779), (Photo 4)

Habitat type(s): grasslands, meadows, bush areas, limestone areas.

Photo 4. *Plebeius argyrognomon argyrognomon*
https://www.google.ro/search?q=Plebeius+argyrognomon

Status*:* common. **Altitude**: 0-1200 m. **Flight period**: V-VI (G1), midVII- midIX (G2). **Protection status**: near threatened and Least concern. **Larval food plants**: *Astragalus glycyphyllos, Coronilla varia*. Myrmecophile species. **Overwintering stage:** larva.

Aricia agestis agestis
([Denis&Schiffermüller], 1775), (Photo 5)

Habitat type(s): found in all habitat types. **Status***:* common and very common. **Altitude**: 0-1700 m. **Flight period**: mid IV-XI. **Protection status**: Least concern. **Larval food plants**: *Geranium pratense, Helianthemum nummullarium, Eredium sp., Geranium sp*. Myrmecophile species. **Overwintering stage:** larva.

Photo 5. *Aricia agestis agestis*
https://www.google.ro/search?q=Aricia+agestis+agestis

Polyommatus icarus icarus (Rottemburg, 1775), (Photo 6)

Habitat type(s): found in all habitat types. **Status***:* very common. **Altitude**: 0-2200 m. **Flight period**: mid IV-XI.

Photo 6. *Polyommatus icarus icarus*
https://www.google.ro/search?q=Polyommatus+icarus+icarus

Protection status: Least concern. **Larval food plants**: *Medicago lupulina, M. sativa. Onobrychis sp., Galega sp., Lotus sp., Ononis sp., Trifolium sp., Melilotus sp., Genista sp., Astragalus sp., Anthyllis sp., Ceronilla sp*. Myrmecophile species. **Overwintering stage:** larva [34].

Polyommatus daphnis daphnis
([Denis&Schiffermüller], 1775), (Photo 7)

Habitat type(s): limestone areas, karst canyons, rock slopes, loess wastelands, steppe meadows, limestone gorges. **Status***:* common and very common. **Altitude**: 0-1600 m. **Flight period**: mid VI- mid IX. **Protection status**: Least concern. **Larval food plants**: *Ceronilla varia, Astragalus slycyphyllos.* Myrmecophile species. **Overwintering stage:** egg.

Photo 7. *Polyommatus daphnis daphnis*
https://www.google.ro/search?q=Polyommatus+daphnis+daphnis

CONCLUSIONS

The countryside around Sibiel village is important for butterflies. Sampling in one season, it was found that the area supported a minimum of more than a quarter of all butterfly species known to regularly occur in Romania.

The relationship of mutualism is best known among the butterflies of the family Lycaenidae and ants. The lycaenide manioces produce nectar by specialized organs and communicate with ants through sound and vibration. This anthrax relationship is considered beneficial for butterfly caterpillars as it reduces larval parasite.

It is known that forty-one percent of all genus ants include species that associate with insects. Ants provide a service in exchange for nutrients in the form of honey, a sugar liquid

excreted by many insect phytopathogens. Interactions between honey-producing insects and ants are often called trophobiosis, a term that combines the notions of trophic relationships with symbiosis between ants and insects.

As a result of the present study of the 59 species of Macrolepidopters collected in 2015 in the high grasslands around Sibiel, Romania, we identified 7 myrmecofile species, belonging to the *Lycaenidae* Family. These species are: *Satyrium spini spini, Satyrium acaciae acacia, Plebeius argus argus, Plebeius argyrognomon argyrognomon, Aricia agestis agestis, Polyommatus icarus icarus*, and *Polyommatus daphnis daphnis.*

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STUDY REGARDING THE SITUATION OF WINE PRODUCERS IN ROMANIA

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Abstract

A face-to-face survey among 209 Romanian wine producers was carried out in order to find out about marketing strategies and the degree of diversification. Results show that producers emphasize the importance of high yields. Half of the respondents' revenues originate from wine sales. Direct marketing is more common than middlemen. While wineries and events are rather common marketing instruments, only 10 per cent of respondents offer accommodation or playgrounds.

***Key words*:** *financial situation, resources, Romania, vineyards, wine.*

INTRODUCTION

Vine culture is an ongoing theme; there is a growing wine industry. Romania, through its climate and the composition of the soils in the plateau and hill areas, is a country that is very well suited for vine culture. The main geographic elements that play a moderating climate role are the Carpathian Mountains, the Black Sea and the Danube. The Viticulture is an activity dated to Romania (on the current territory of our country) from ancient times, grapes and wine forming for hundreds of years some of the country's greatest natural riches. The ancient writers noted that Burebista had brought the Geto-Dacian kingdom to the greatest extent, uniting the ancient tribes, but only after exterminating the vineyards. Even the word "grape" is of Dacian origin. Historian Gustave Glotz (1925) noted: "Long before it was consecrated by Dyonysos, vines formed joy of prehistoric peoples." [3]
Approaching to our times, the Cotnari vineyard has been attested over 600 years ago. Over the time, other vineyards from Romania have become famous: starting with Murfatlar in Dobrogea, Sâmbureşti and Drăgăşani in Oltenia, Odobeşti and Panciu in Moldova, or Recaş and Tarnave vineyards in Transylvania. Currently, international statistics places Romania among the top 15 world wine powers. Such a classification takes into account the land size of the vineyard, but especially the best quality of the wines still made in the main vineyards of Romania [12].
Having a significant agricultural area, our country also benefits of important areas cultivated with vines. Viticulture generates 14 % of turnovers of Romania's vegetal production, equalling a market of 400 million Euros (the average of the wine market turnover in the last 10 years) [1,10].
In 2015, Romania had about 180,000 hectares of vineyards (over 5% of the Romanian agricultural land), grouped in 37 large wine regions. In fact, the top 10 Romanian wine producers have over 15,900 hectares of vineyards, only the first place cultivating more than 3,000 ha. However, during the last 15 years, the export of Romanian wines has declined considerably so that much of the produced wine is used for domestic consumption [12]. The greatest quantity of wine consumption is registered in the rural area for the social category of farmers [7].
The main destination for the exports, generally, was Germany [9].

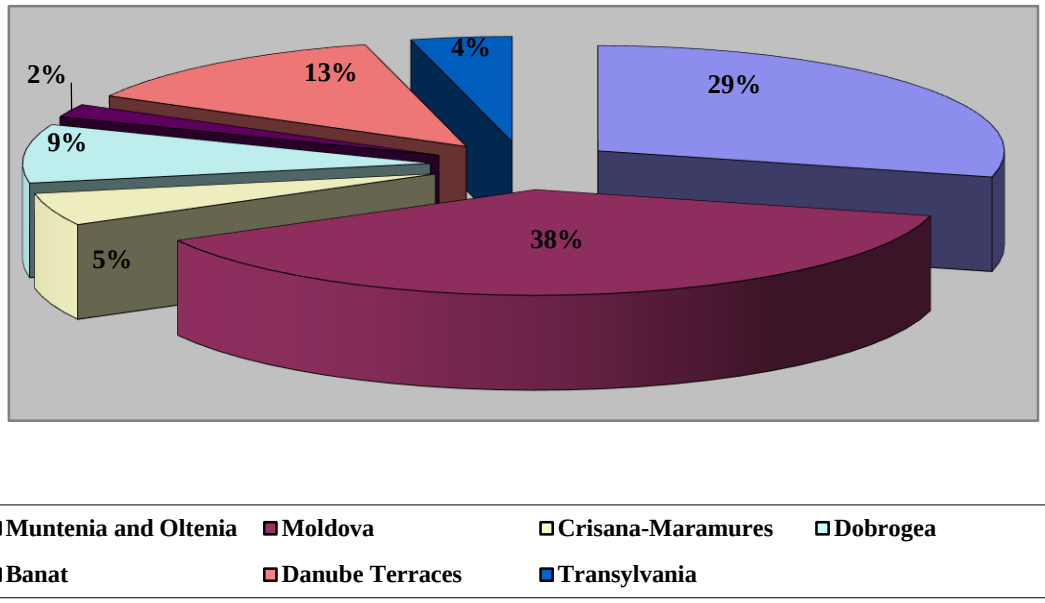

Fig. 1. Main wine regions of Romania - 2014 (%)
Source: [8], [11]

From the point of view of the percentage distribution of vineyards by regions, Moldova prevails with 38% of the total wine area of the country; followed by Muntenia and Oltenia with 29%; Danube Terraces – 13%; Dobrogea – 9%; Crisana-Maramures – 5%; Transylvania – 4%; Banat – 2%. In Figure 1 we can better see this distribution.
In Romania, the vineyard tourism is generally made in groups formed by friends, family or workmates. The group size is usually of 3 to 5 persons. In the case of foreign tourists, the groups are usually larger, of 20 persons on the average [2].

MATERIALS AND METHODS

In this paper we made an assessment on the productivity and financial satisfaction of the Romanian wine producers based on the questionnaires and national statistical data [5]. The survey was done between 1 February 2017 and 3 May 2017 by 209 producers (totalling more than 23,582 ha of vine) which come from both the small producers (with 500-600 square meters of vineyards) and the largest producers of our country (having up to 3,000 hectares of vineyards). The questionnaires represent the most popular method used in socio-economic research and it is one of the best in many ways, and especially the financial one.

Questions in the survey followed both quantitative (What percentage of the working time is devoted to wine-growing activity? What quantities of grapes or wine are marketed? What surfaces they possess? Which elements form the turnover and the percentage? What tourist facilities do they have and can be made available to potential tourists?) and qualitative data (In what county is production going on? When were you born? What kind of studies do you have? What is the financial situation of the farm?).
We also focused on addressing face-to-face survey questions to better communicate with interviewees, to keep them informed about our research goal, hoping to have the most sincere and realistic answers.

RESULTS AND DISCUSSIONS

As we mentioned above, the questionnaires were applied to 209 respondents, which came from 25 counties.
1. ***County or counties*** where production takes place - most wine producers interviewed operate on the surface of a single county but we met some exceptions that carries out its activities on two or even four counties. The main counties as the number of respondents to

our questionnaires are Vrancea - 44, Prahova - 30 and Vâlcea with 20 producers. For the other 22 counties, the number of completed questionnaires differs between 1 and 16.
The number of responses is mainly due to the visibility of the producers, but also to the importance of the vineyards in some counties

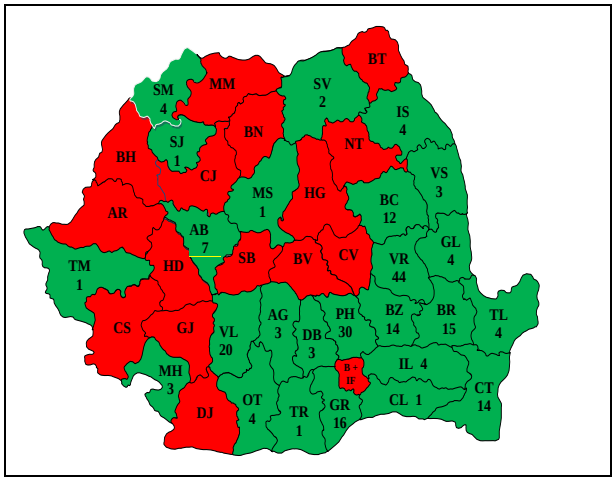

Fig. 2. Origin of respondents by Romanian counties
Source: [4]

2.***Year of birth*** of the person interviewed - the average age of the Romanian winemakers is 48 years.
3.***Gender*** - over 80% of men, but we have also encountered a high number of women in a considered job of men.
4.***Last graduated school*** - the calculated average tells us that most of them have at least graduate high school (with baccalaureate diploma);
5.***Full-time or part-time activity*** - unfortunately only 54% of the respondents have the full wine production concern, most of them being forced to carry out other remuneration activities;
6.***Selling price of grapes*** (if they sell grapes) - about 33% of producers sell grapes and the average price / kg is about 1.6 lei;

Table 1. The price of wine in Romania for 0.75 l

Wine price	**%**
under 10 lei / 0.75 l	59.4 %
between 10 and 25 lei/0.75 l	20.94 %
between 25 and 40 lei/0.75 l	12.68 %
over 40 lei/0.75 l	6.98 %

Source: Own calculation.

7.***The price of wine*** - For about 46% of the interviewees the winemaking is not the main source of income, the results obtained being, consequently (Table 1).
Thus, much more than 50% of the wine direct marketed by the producers is sold at a price of less than 10 lei / 0.75 l
8.***The agricultural area*** - as the questioned vine growers distributed it. The obtained results with the area of land cultivated by wine producers are shown in Fig. 3 as follows:
- Over 12 ha is the average of the arable land exploited by each producer;
- Approximately 3.4 ha is the average of the areas occupied by meadows;
- The vineyard culture - our country have some important areas cultivated with this plant - the resulting average is of 112.83 ha / producer;
- Almost 5 ha are grown on average with other perennial plants, especially fruit trees (soils suitable for the vine are very good for these plants as well).

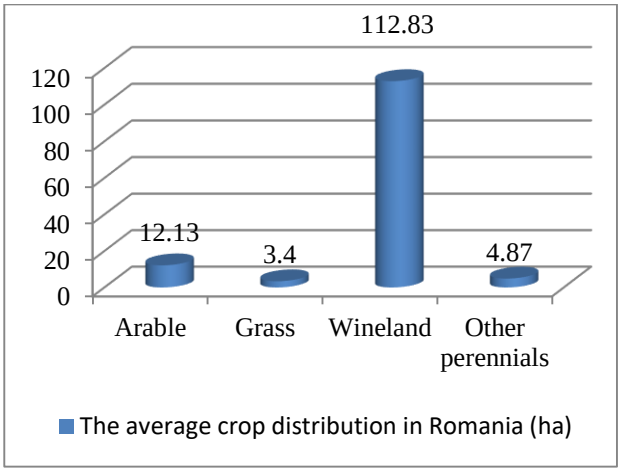

Fig. 3. Average distribution of agricultural areas for the 209 interviewed producers.
Source: Own calculations.

9.***The financial resources*** of producers are highlighted in Figure 4. We find the following percentage situation:
-Nearly 50% of the average revenue comes from the sale of grapes or wine;
-13.76% come from agriculture, except for viticulture;
-1.98% of the various forms of tourism practiced on the farm;
Over 34% of revenues are financial sources from other activities outside the agricultural holding.

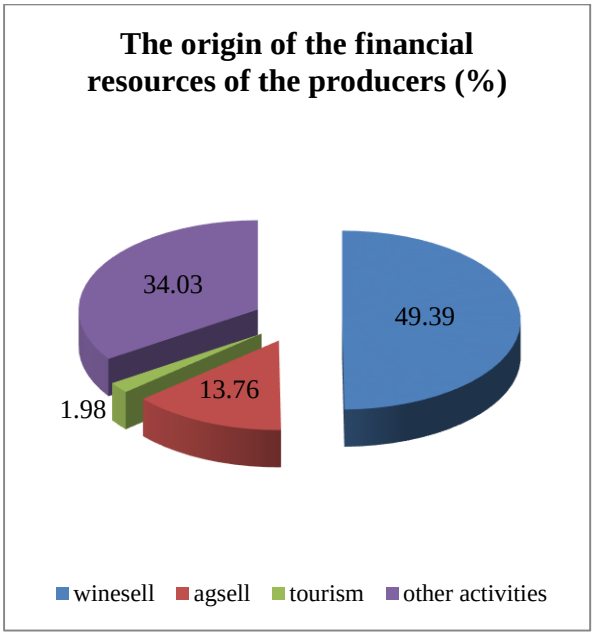

Fig. 4. The origin of the financial resources of the producers
Source: Own calculations.

10. ***Direct sale of wine or through specialized distributors*** (Fig. 5)
Direct sales predominate: direct sales (included restaurants) - 78.1% and specialized distributors - 21.9%.

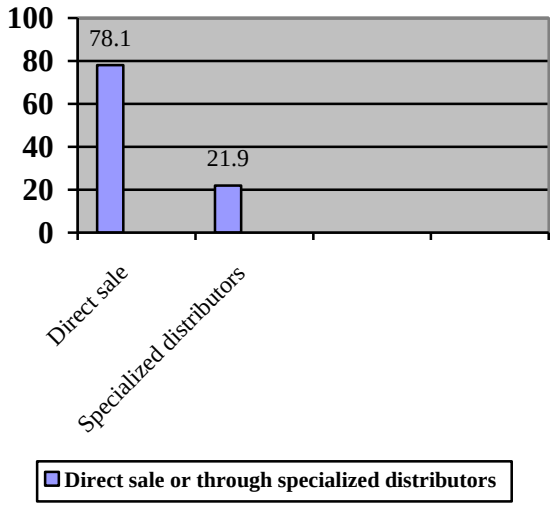

Fig. 5. Direct sale of wine or through specialized distributors
Source: Own calculation.

11.***Tourist facilities*** offered by wine producers (Figure 6). Although, in terms of the overall income average, tourism activities in wine farms are not very high (less than 2%) but they are on the upward path, most of the producers wanting to combine these two branches. In some cases, profits declined greatly due to investment in tourism.
Thus, in terms of facilities, we received the following answers:
-17% of respondents can provide food services;
-73% have wineries, cellars or at least one basement where they can store their wines (some of them can also organize wine tastings at their own farm);
-10% can offer accommodation for the tourists who wish to overnight in a vineyard;
-approximately 10% provide a playground for children;
-over 39% participate in different events: fairs, exhibitions, etc.;
-7% also offer other services worth mentioning.
12.***The attitude of Romanian wine producers*** towards the following statements:
• Productivity per unit area - the majority emphasized the amount obtained per hectare (quality going somewhat on a secondary level). The average is 6.08 points out of 7;
• The contribution of tourism activities to the direct sale of wine - because tourism revenues represent less than 2% of the average of the income of the respondents, we can perceive the somewhat favorable answer (4.58 points) rather as a logical assumption of the majority of the interviewed. Even under these conditions, the general trend transmitted by the majority of respondents was to diversify the farm activities and to combine in the near future wine production with rural tourism;
• the existing portfolio (5 points) - broadly they have loyal customers - this is relatively easy when quality products are sold at affordable prices;
• support from the local authorities and the state (4 points) - as the state and the local authorities have accustomed us not only does not help but also often confuses the situation (the obtained result having an artificial increase because a significant part of them (also very nice respondents) come from the employees of the local authorities;
• The location of the farm in the scenic area (5.60) - the attitude, from this point of view, is

favorable, the producers being pleased with the picturesque of the place.

In Table 2 we can more easily see the information presented above.

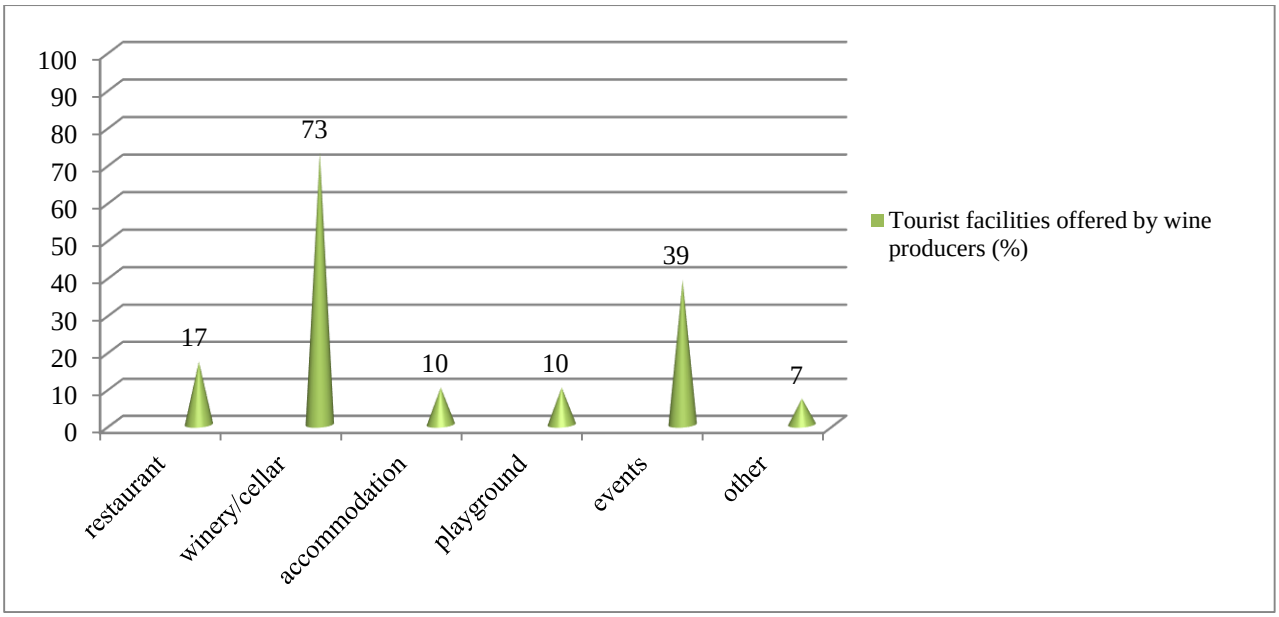

Fig. 6. Tourist facilities offered by wine producers
Source: Own calculations.

Table 2. The attitude of Romanian wine producers

Crt.No.	Statements	Average
1	Productivity per unit area	6.08
2	Contribution of tourism activities to the direct sale of wine	4.58
3	Portfolio	5.00
4	Support from the local authorities and the state	4.00
5	Landscape	5.60

Source: Own calculations.

CONCLUSIONS

Information such as: financial satisfaction, the price of grapes and, partly, of wine, the attitude of the farmers and others could be generalized in our country, the calculated averages, largely, are according to the literature.

The wine production and other agricultural products in Romania are influenced by weather conditions – in other countries with a tradition in wine production, a number of systems have been developed to protect the vine as well as possible (for example against the frost);

Romania remains an important European wine producing country, having a great historical past and rich cultural traditions.

The country ranks the 21st in the world in terms of wine consumption per capita - according to the National Institute of Statistics, wine consumption in Romania is over 25 l per capita / year.

The average is 5 million hectolitres of wine / year that are produced in the country, of which about 1.5-2 million hl are marketed, but only a little part is exported compared to the domestic market, the rest, more than a half being self-consumption [12].

The tourist activities in the vineyards or wine producing farms do not bring too much financial contribution, but they are in continuous process of development from this point of view [6].

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QUALITY OF PRODUCTS, THE CONCEPT, FUNCTIONS AND FACTORS THAT INFLUENCE IT

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Abstract

The paper aimed to present the quality of products, the concept, functions and factors that influence it. Primordial for public health policy and economic policy is to protect the health of organisms, especially humans, at all stages of the technological process. On the worldwide level there is a tendency to ensure that citizens have access to safe and nutritious food, and therefore, it is a must to guarantee the proper functioning of the food industry. International policy protects health at every stage of the production process, that is at every stage of the process, from the agricultural farm up to the consumer. It intends to prevent food contamination and promotes food hygiene and documentation on the health and welfare of plants and animals.

Key words: *health, market, quality of products, questionnaire method, consumer's opinion on product quality*

INTRODUCTION

Protecting the health of organisms, especially those of humans, at all stages of the technological process is of primary importance for the public health policy as well as the economic policy. Worldwide, there is a tendency to ensure citizens access to safe and nutritious food and food, made from very healthy animals and herbage.[8] For this purpose, it is necessary to guarantee the proper functioning of the food industry. International policy protects health at every stage of the production process, that is, at every stage from the farm up to the final consumer. It aims at preventing food contamination and promoting food hygiene and documentation on the health and well-being of plants and animals. Quality is defined as an important feature of all services and products[2]. It is a summation of the features of a product and service to meet the needs of existing consumers, needs that may be expressed or not. In specialized documents quality has also been defined as "what the customer is willing to pay according to what it gets and capitalizes", respectively "fitness for use". The level of quality is directly proportional to the level of fulfillment of its functions: the economic function (referring to: different aspects of the economic type throughout the realization of the products and the efficiency of the entire economic process); the technical function relating to the functional and technical features of any product; the social function which refers to the way in which the quality of any product directly influences the quality of life and the environment.

MATERIALS AND METHODS

A feature of quality is that it is in a perpetual redefinition, being modified to meet the growing demands of consumers. Since the 1980s Western enterprises, especially the American ones, have understood two aspects previously neglected:

- the importance of quality and customer satisfaction related to quality for the success of the enterprise;
- the need to consider quality not only as a single objective but also as a management objective. Quality is an essential part of products and services.[7] According to STAS ISO 8402 - 1995, quality is the totality of the particularities of a product that assigns the role of meeting the customer's default requirements.[6] Dictionaries and specialized

writings offer many other definitions of quality, such as:
-Quality is customer satisfaction;
-Quality is fitness for use;
-Quality is what the customer wants to buy and enjoy. [1]
-Quality has a technical part that characterizes the attributes of all products and services made by manufacturers. That is why a product has a higher degree of quality than another.
-Quality is what makes the product to be bought. The conditions that drive the success of an outlet and selling products are multiples. They include the market conditions, the nature of the product/ service, the image created by advertising, the socio-cultural particularities of the customers, etc. The most important feature that ensures product resistance on the market is their quality that has been audited by the consumer[3].
The method used to learn the needs and the greatest consumers is the questionnaire.[4]
Polls will be conducted by completing questionnaires and interviews applied to the producer, distributor, consumer.

QUESTIONNAIRE

Name .....Forename.....
Gender M F Age.....
Education .....
Proffesion .....
Product name: Bread, Producer„Dobre and Sons"
GENERAL QUESTIONS

Please tick the answer:

1.How long have you been using bakery products of „Dobre and Sons"?

□ Less than 6 months	□ Between 6 months and 1 year
□ Between 1 and 3 years	□ More than 3 years

2.Why did you choose to use bakery products of „Dobre and Sons"??

□ Quality products	□ Out of habit
□ Competitive prices	□Other

3.What makes you continue to use bakery products of „Dobre and Sons"?

□Quality products	□Out of habit
□Competitive prices	□Other

4.What bakery products of „Dobre and Sons" do you prefer?

□Black bread without additives	□Graham bread	□Toast specialities
□Casino bread	□Small French Bread	□White rustic bread
□Fresh baguette	□Shaped bread	□White small French bread

5.How often do you use bakery products of „Dobre and Sons"?

□Once a week or often	□Three/four times a month
□Once a month	□Rarely

6.What do you like at the bakery products of „Dobre and Sons"?

□Freshness	□Taste	□Consistency	□Packaging
□Ingredients	□ Form of delivery	□ Diversity	□Shape

7.What do you dislike at the bakery products of „Dobre and Sons"?

□Freshness	□Taste	□Consistency	□Packaging
□Ingredients	□ Form of delivery	□ Diversity	□Shape

8.How important are the following features of the bakery products „Dobre and Sons"? (Add a number as: 1- unimportant, 2- neutral, 3- important, 4- very important).

Smell	□
Taste	□
Color	□
Freshness	□
Product safety	□

9.Have you heard of the Food Safety Management System (ISO) and HACPP (Hazard Analysis Critical Control Point)?

□ Yes	□ No	□ I don't know	□I'm not interested

10.Did you know that „Dobre and Sons"company has implemented ISO and HACPP (ISO Certificates 140001: 2004; ISO 22000:2005)?

□ Yes	□ No	□ I don't know	□ I'm not interested

11.Knowing that implementing food quality and hygene standards at their bakery products is very important for „Dobre and Sons"company, would you recommend these products to other people?

□ Yes, certainly	□ I'm not sure
□I'm not interested	□ No

12.Specify aspects that can be improved at the bakery products„Dobre and Sons"that you have eaten.
.....
.....
.....
.....

This questionnaires were applied to a group of 120 people of different ages: from under-18s to over 60s.

RESULTS AND DISCUSSIONS

Types of bakery products regularly consumed

White bread is consumed by all people, followed by graham bread and in much smaller quantities the black bread without additives, the fresh baguette and casino bread (Fig.1.)

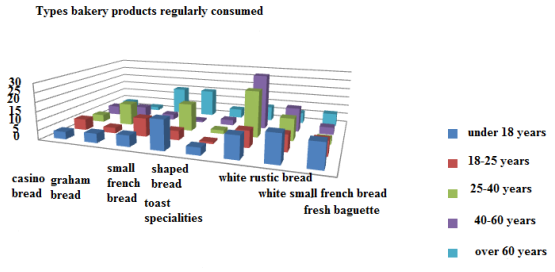

Fig. 1.Types of bakery products regularly consumed

White bread is preferred by people over 60, with twice as high percentage as those under the age of 18. People aged between 18-25 years and 25-40 years consume relatively equal amounts of white bread. Black bread without additives, casino bread and graham bread is consumed in negligible quantities.

Degree of client satisfaction

Figure 2 shows graphically the customer's satisfaction with the bakery products of Dobre and Sons on the basis of freshness, ingredients used, taste, delivery form and presentation, consistency, diversity and packaging.

As you can easily see, young people aged 25 to 40 are the most interested in ingredients, in order to benefit from healthy products and a balanced diet.

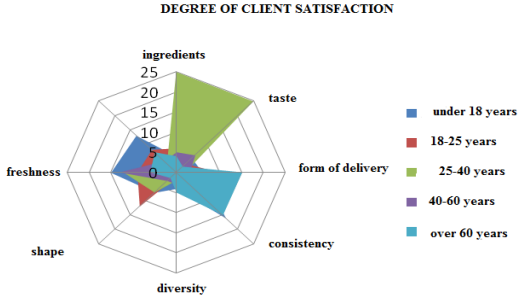

Fig. 2. What do you like at these bakery products?

People over 60 are most interested in delivery forms, partly due to the limitation of their financial possibilities, and people under 18 are most attracted to the form of presentation, packaging and taste in all the diversity of its flavors.

Degree of dissatisfaction regarding bakery products of „Dobre and Sons".

Figure 3 shows graphically the degree of customer dissatisfaction regarding bakery products of „Dobre and Sons", based on freshness, ingredients, taste, delivery form and presentation, consistency, diversity and packaging.

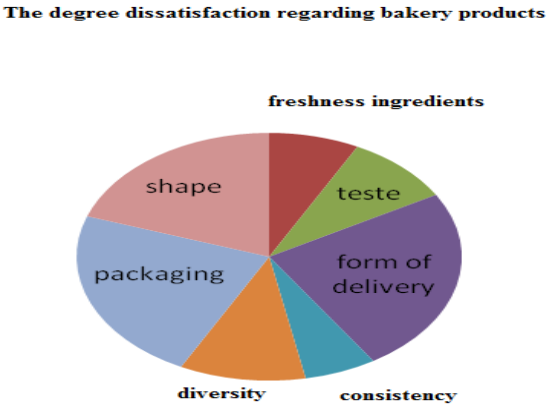

Fig. 3. The degree of dissatisfaction regarding bakery products of „Dobre and Sons"

As one can observe, the percentage of dissatisfaction has increased and similar shares to the criterion of consistency and freshness. Following the applying of the questionnaires, customers have specified that some packaged bakery products tend to mold shortly after purchase due to the fact that they are hot when packed, which favors the emergence of mold on products.

The importance of different characteristics of „Dobre and Sons"bakery products

Figure 4 illustrates the importance of different aspects of „Dobre and Sons" bakery products: smell, taste, color, freshness, product safety. Organoleptic characteristics are as important to consumers as the safety of the product. As time has passed, the consumer has been educated itself about the quality assurance of the purchased products, thus implicitly about the safety of the bakery products. This is very important because the customer is no longer willing to buy and consume anything,

anywhere. This is why the responsible producers who will invest in the safety of the people and implicitly in their company's reputation will be the ones surviving on the market.

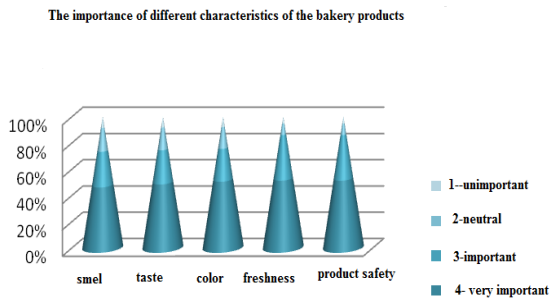

Fig.4 The importance of different characteristics of „Dobre și Fiii”bakery products

Consumer's knowledge on food safety

Consumer knowledge of the Quality Management System is represented in the diagram of Figure 5.

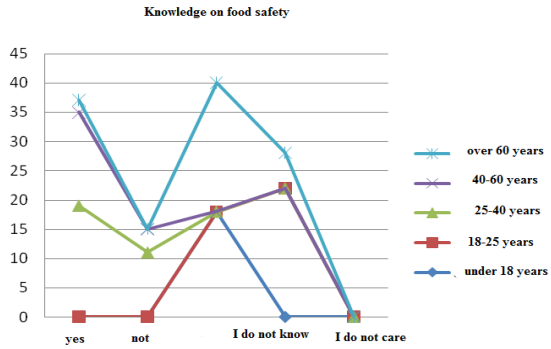

Fig.5. Knowledge on Food Safety Management System

Adolescents have no knowledge of food safety; they think it's important for a product to be safe, but they do not have any concrete information about it.

For people aged 18 to25, there is a lack of interest in this area. For people aged 25 to 40 we may talk about knowledge and interest in food safety because 2/3 of respondents have answered affirmatively.

This also applies to people aged 40-60. People aged over 60, 75% do not know and 25% are not interested. They do their shopping in connection to the price of a product.

Knowing the implementation of HACCP at „Dobre and Sons” company

There is a paradox in the case of adolescents: although they say they have no knowledge of the Food Safety Management System, 83% answer affirmatively when asked about knowing how the system is implemented the system at "Dobre și Fiii". Surely the answer is directly related to the fact that the company and its products are well-known. (Fig.6).

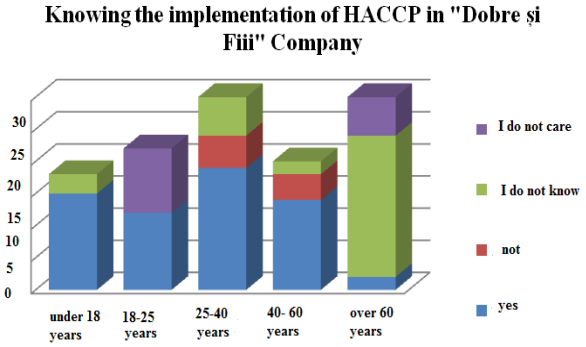

Fig. 6 Knowing the implementation of Hazard Analysis Critical Control Point in "Dobre and Sons" company

At young people responses we noticed equal percentages of affirmative responses and lack of interest in the subject. For the 25-40 and 40-60 age groups, there is a major interest in this subject, with respondents mostly responding affirmatively. For seniors, interest in this issue is almost zero, with other considerations in mind.

Knowing that implementing food quality and hygene standards at their bakery products is very important for„Dobre and Sons” company, would you recommend these products to others?

The following figures illustrate the answers to the question: "Knowing that implementing food quality and hygene standards at their bakery products is very important for „Dobre and Sons” company, would you recommend these products to others?" as follows:

Fig.7 reflects the affirmative answer of the respondents by age category. An approximately equal number is found for the first four age categories and a very low interest for seniors.

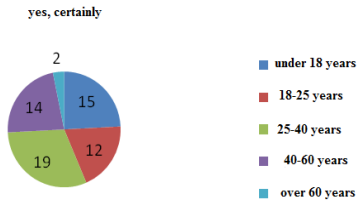

Fig. 7. The share of YES answers by age of the respondents to the question "Knowing that implementing food quality and hygene standards at their bakery products is very important for "Dobre and Sons" company, would you recommend these products to others?"

Figure 8 shows that a small and sensitively equal number of mature individuals have uncertainties about the recommendation of the company and its products.

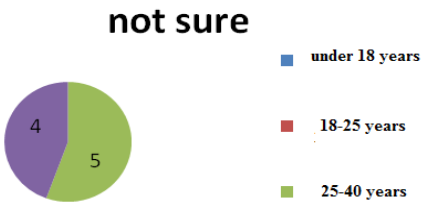

Fig. 8. The share of NOT SURE answers by age of the respondents to the question "Knowing that implementing food quality and hygene standards at their bakery products is very important for „Dobre and Sons" company, would you recommend these products to others?"

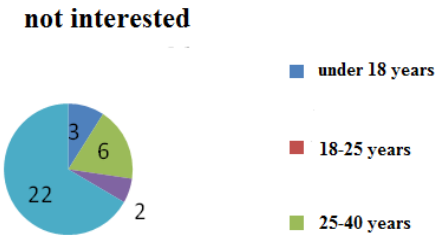

Fig. 9. The share of NOT INTERESTED answers by age of the respondents to the question "Knowing that implementing food quality and hygene standards at their bakery products is very important for „Dobre and Sons" company, would you recommend these products to others?"

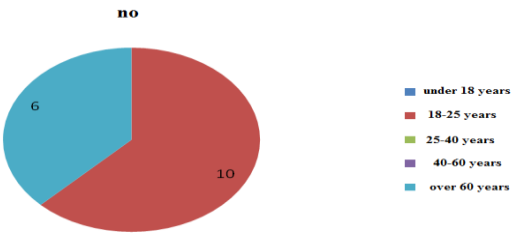

Fig. 10. The share of NO answers by age of the respondents to the question "Knowing that implementing food quality and hygene standards at their bakery products is very important for „Dobre and Sons" company, would you recommend these products to others?"

Two-thirds of respondents (i.e. those over the age of 60) are not interested in recommending the company and its products due to HACCP implementation, because they make recommendations based on the quality and price of the products (Fig.9.).

Figure 10 shows that seniors and young people do not recommend products based on the implementation of the food safety system, the reasons for the recommendations being quite different.

Aspects which should be improved regarding „Dobre and Sons" bakery products

Regarding the aspects that can be improved with „Dobre and Sons" bakery products, those have been mentioned the most are the following ones:

• moisture of packaged products;
• storage time after unpacking;
• consistency of the core.

Adolescents and young people were not very brief and determined to specify the issues that can be improved.

The mature people know very well what they do not like, therefore needs to be improved and the seniors are generally dissatisfied, but they do not mention strictly the quality of the products.[9]

In terms of gender distribution, women are more precise and brief in their language and more attentive to details, while men are more vocal, but they are not based on real facts and on important aspects in their argumentation. Men buy products under the influence of current factors; most women are knowledgeable and realistic customers.[5] Women are very observant to the characteristics of food in general and, more so, when it comes to products for their own children.[10]

CONCLUSIONS

In order to detect the opinions and satisfaction of the clients of C.C „Dobre and Sons" L.T.D. regarding the products manufactured and marketed by the economic agent, a questionnaire was established. It was applied to a group of people of different ages: from under

18s to over 60s. The results of the questionnaire were represented in graphic forms and analyzed. There have been important and interesting things discovered related to meeting consumer requirements.

Analyzing the results, we noticed that respondents, regardless of age, sex, occupation, noticed that fresh bread has a wet and slightly sticky core, and the storage time is very short because the products quickly mold.The results confirm that cooling is a critical control point. The indicators related to the technological cooling operation were analyzed: air temperature, air humidity, cooling time. The first two indicators have normal values, the only indicator whose value needed change was the cooling time. For this purpose, the cooling strip was re-designed, changing its length. In order to do this, the cooling and packing compartments were resized by giving up a partition made of lightweight materials. At the same time, the length of the cooling band was increased, the circuit getting a sinuous shape from the output of the furnace up until packing and storage / delivery. In the first part of the circuit, thecooling strip passes over the tunnel furnace, where the air is hot and humid, then gradually reaches the packing and delivery area where, with open space, the air is ventilated and has much lower temperature and humidity.

After the bread cooling circuit was modified, there was an increase in the sales of the white rustic bread product and thus in the fiscla value.

The HACCP system has been modified following its reassessment. Cooling has remained a critical point of control. Modifying the cooling circuit has removed the "wet and sticky core" defect for the moment, but periodic monitoring of the process is necessary.Implementation of HACCP is of major importance in a bakery factory because, since critical control points are identified and the values to be monitored are determined and strictly fixed, the final quality of the products can be controlled. Once again the importance and usefulness of HACCP implementation system is confirmed.

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INDONESIAN EAT RICE, BUT WHY FARMERS ARE POOR?

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Abstract

Rice is Indonesian's staple food and indicator of food sovereignty. Farmers could be a price maker, but rice farmers are poor. This indicates that the problem exists on post harvest rice distribution channels. It is important to analyse the rice distribution system to formulate the government policies. The purpose of this paper is to know the distribution system and margin share of post harvest rice in Indonesia. Also, to know the determinant factors of farmers bargaining power in the post harvest rice distribution process. Data analyse use descriptive analysis (elasticity of price transmission) and literature review. The supporting data used are data from agriculture statistics of Indonesia. The results show that the market faced by all rice distribution market players is the imperfect or uncompetitive actor, i.e. there is monopoly and oligopoly power in the distribution system, and the prevailing distribution system is not efficient yet. There are internal and external factors that influence the bargaining power of rice farmers. The post harvest rice distribution chain needs to be shortened to make it more efficient. To improve the bargaining position of farmers from a monopsony condition is to establish a farmers institution.

Key words**:** *rice distribution chain, margin share, bargaining power, elasticity of price transmission*

INTRODUCTION

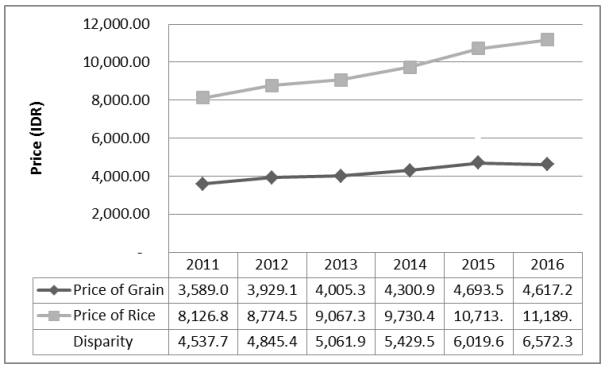
For Indonesia, rice is such an integral part of life, its consumption is often taken for granted — not just as a staple food but as a driver of national food security, regional political stability, economic growth, and its potential to elevate whole communities out of poverty [26]. Farmers are often identified as hardworking workers who work full of mud and sweat, while the results obtained are classified as minimal in a long time span as well. This view is considered reasonable when viewed from the profile of farmers in Indonesia. Data from The National Labor Force Survey (Sakernas) in 2013 shows that human resources in agriculture sector is 72.6% of whom are just graduated from elementary school or not attend school [2]. The survey results show how low the formal education of farmers in Indonesia. Although to be a farmers there is no requirement related to formal education, but to become a successful farmer and professional still needed good competence and skill.

The agricultural sector plays an important role in the economy of Indonesia, one of which is the second largest contributor to Gross Domestic Product (GDP). In 2014, the agricultural sector accounted for 13.38% of Indonesia's total GDP [3], and absorbed 34.28% of Indonesia's total labor force [21].

One of the determinants of farmers welfare is the acquisition of the sale of agricultural products, where in paddy cultivation, the farmers generally sell in the form of dry grain (GKP). Dry grain (GKP) is the end result of agricultural paddy or rice cultivating [21]. The dry grain (GKP) is then processed to rice through milling, and through the distribution process to the level of rice retailers. Figure 1 shows the average price of dry grain (GKP) and retail price of rice (HEB) per year, from 2011 to 2016.

High disparity of rice price shows that both rice farmers and consumers are not get benefited in the rice trade. If the value added is not received by rice producers and consumers, then it is more likely to be received by intermediary traders. Marketing theory explains that price disparity in a marketing line can be caused by two things, namely the market power of intermediary traders and/or supply chain that are too long, so the margin that occurs in a

supply chain from producers to consumers (vertical) becomes inefficient and very large.



	2011	2012	2013	2014	2015	2016
Price of Grain	3,589.0	3,929.1	4,005.3	4,300.9	4,693.5	4,617.2
Price of Rice	8,126.8	8,774.5	9,067.3	9,730.4	10,713.	11,189.
Disparity	4,537.7	4,845.4	5,061.9	5,429.5	6,019.6	6,572.3

Fig.1. Disparity in Price of Grain and Rice per Kilogram in Indonesia, Year 2008 – 2014
Source: Central Bureau Statistics (2017) [7]

There is a lot of phenomenon that the rate of price change at the rice retailer level is greater than the rate of price change of dry grain (GKP) at the farmers level. The markets faced by all market participants are imperfect or uncompetitive actors, i.e. there is a monopoly and oligopoly power in the marketing system as well as inefficient marketing system. If viewed from macroeconomic theory, the high rice prices will be bad for the Indonesian economy. The government is always trying to regulate the price of rice at a certain level that is profitable for both farmers and consumers, moreover rice is one of the main commodities for inflation. The government is positioned in a food price dilemma, where consumers want rice in the low prices, but farmers want the opposite. Under this dilemma, the government is expected to be able to adopt a rice price policy that can combine the interests of rice farmers and consumers. The suitability of rice price policy will be seen when rice prices are considered high at the level of rice farmers but low at the consumer level.

The low productivity in the agricultural sector has implications for the low income of farmers. One of the causes is limited land owned by households, especially in Java Island. As a result, the purchasing power of farmers is also low, so this situation will encourage farmers to poverty.

In 2013, out of 28 million poor people in rural Indonesia, more than two-thirds were farmers. This is even more alarming, since the real income of farmers has also not changed significantly over the last 3 (three) years. Farmers Exchange Rate (NTP) is relatively stable during the year 2011 - 2013 at number 104. This shows the income received farmers from the agricultural sector slightly higher than the expenditure. There is no surplus for farmers.

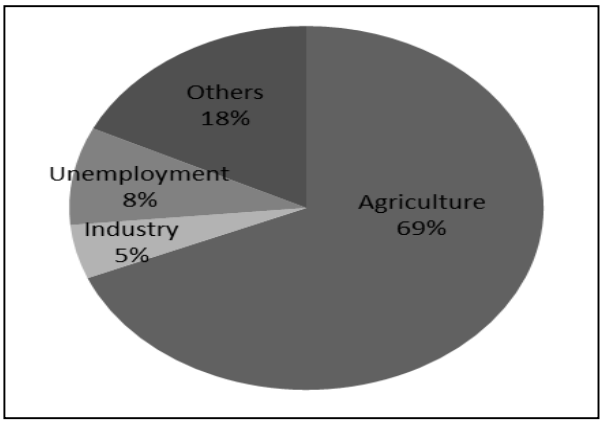


Fig.2. Percentage of Poor Households in Rural Area by The Occupation of Head of Household
Source: Central Bureau Statistics (2014) [2]

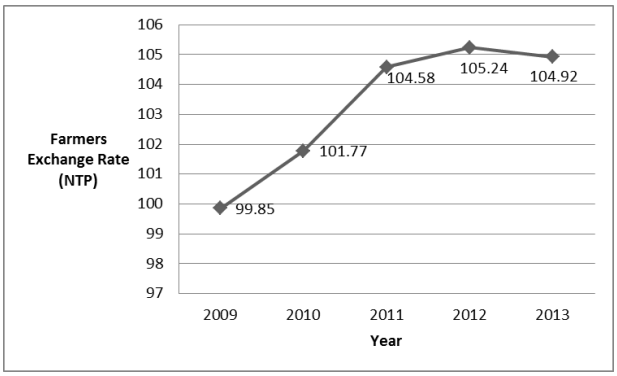


Fig.3. Farmers Exchange Rate of Indonesia Year 2009 – 2013
Source: Central Bureau Statistics (2014) [2]

There is a widespread belief that farmers will be more prosperous if they can produce higher priced products in the retail market, but other research results suggest that farmers do not benefit from high commodity price growth at the retail level [20]. This shows that farmers' profits are more determined by the price of grain. One source of low selling price of grain received by farmers is the length of the grain supply chain.

The high price fluctuations are also a routine phenomenon that almost every year occurs in the seasonal distribution system of agricultural

products. When the harvest season, the product is abundant but the price is very low, vice versa at the time of the harvest season, the price so high. This causes the high harvest is often a frightening specter for farmers. In addition, the problem of distribution is often a constraint and obstacle for producer farmers in implementing their farming, especially concerning the many demands and challenges faced in the distribution process, such as: quality demands, quantity demands, and demands of consumer demand. All these demands became a classic problem in agricultural development.

Although demand for rice tends to be constant, and only significantly influenced by population, problems arise when there is a gap between production and consumption. Rice production fluctuates following cropping pattern, while rice consumption tends to be stable throughout the year. Rice surplus increases during harvest, while in dry season and planting season deficit. The price of rice has the potential to decline when production is abundant (harvest season) to the detriment of farmers, and otherwise rice prices will rise at a time of deficits that harm consumers so that rice prices will fluctuate throughout the year.

After the enactment of rice market deregulation policy in Indonesia in 1998, precisely disparity of rice price at farmer level with rice price at consumer level widened. The policy should make the rice distribution market lead to more competitive market conditions, and if the market mechanism is running perfectly, then intermediary traders will not be able to create large marketing margins. The current unfavorable conditions, where disparities of rice prices are widening, indicate anti-competitive behavior among intermediate traders. Deregulation policy increases domestic rice prices by around 125 percent, poverty increases in both rural and urban areas. One of the causes of asymmetric price transmission between vertically connected markets (in one distribution chain) is the existence of uncompetitive behavior among intermediate traders, especially if the intermediary trader is in a concentrated market. The intermediary trader will certainly try to maintain the profit level, and will not change the price according to the actual price. Intermediary traders will more quickly respond to price increases than price reductions, thus triggering competition restraint on distribution channels and imperfect price transmission between manufacturers and consumers. The absence of price transmission between two different market levels in one marketing chain is caused by an uncompetitive market. It clearly states that for agricultural commodities, imperfect competition in the marketing chain opens up space for middleman to abuse its market power.

The purpose of this paper is to know the distribution system and margin share of post harvest rice in Indonesia. Also, to know the determinant factors of farmers bargaining power in the post harvest rice distribution process

MATERIALS AND METHODS

Economic justice

Justice according to John Rawls, is a measure that must be given to achieve a balance between personal interests and common interests [18]. There are three principles of justice, namely: (1) the same great of freedom; (2) differences; (3) equitable equality of opportunity. Adam Smith only accepted the concept of commutative justice, with the principle of no harm (non harm to the rights and interests of others), non intervention, and fair [9].

The economy as a business and human action to fulfill its need for goods/services that the number is limited [20]. The goal of any economic activity is to create a constant balance between necessity and supply. As both population and consumption continue to increase, the need is constantly increasing.

Thus justice in the economic field is a situation or situation in the safe that everyone gets what he deserves. This means that justice in the economic field is a fair treatment for everyone to earn a decent living in accordance with the needs and potential that exists.

Supply Chain

Supply Chain is a system where producers and distributors distribute goods and services to consumers. Supply chain is a network of organizations involved from upstream to

downstream, in different processes and activities that produce value in the form of products and services for the end user [5]. In a good supply chain there is a supply system that must be defined, designed and implemented to get an effective flow of material, information and funds in a supply chain [4].

The value chain approach can explain the distribution of profits occurring in a chain, so as to identify appropriate policies for better profitability. The most common empirical indicators used in the assessment of marketing efficiency include marketing margins and price transmission from the consumer market to farmers or to the producer's market. If the marketing margin is the sum of the marketing costs and the trader's profits are smaller, then the distribution system is said to be more efficient. In other words, the difference between the price received by farmers and the price paid by consumers is getting smaller. An efficient distribution system is expected to push the selling price of rice at the consumer level.

It is necessary to study in various fields to improve understanding for the development of rice and rice supply chain, including the use of technology and innovation. However, these efforts must be accomplished with a balanced principle, especially by the actors involved in it. The dynamic interaction between the various actors working in agriculture, the future food system strategy, and the innovative development of ideas can and should be utilized to generate welfare, income and stability, and thereby ensure food security at local, regional and global levels [24].

It should be reviewed also related to the price transmission elasticity of dry grain (GKP) and rice prices, so that more clearly the effect of price changes. The analysis of price transmission elasticity is an analysis that illustrates the extent to which the impact of a goods price changes at one level of the market on the price change of that good in another place or market level [8]. The price elasticity formula of price is:

$$E_t = \frac{\delta Pr/Pr}{\delta Pf/Pf} \text{ or } Et = \frac{\delta Pr}{\delta Pf} \cdot \frac{Pf}{Pr}$$

Pf and Pr are linearly related in equation Pf = a + b Pr,

$$\text{so } \frac{\delta Pf}{\delta Pr} = b \text{ or } \frac{\delta Pr}{\delta Pf} = \frac{1}{b}, \text{ and } E_t = \frac{1}{b} \cdot \frac{Pf}{Pr}$$

Where: Et = Price transmission elasticity
a = Intercept
Pf = Price at producers level
Pr = Price at consumers level

Government policies of post harvest rice distribution

The role of government in the post harvest rice distribution between one country and other countries is generally different. This is adapted to the existence of different interests and objectives in the handling of domestic rice market. When viewed from the intensity of government's role in rice marketing. There are some form of extreme direct involvement in operations, such as in the African countries of the 1960s, but there are also only limited in the form of coaching and creating a climate that encourages the creation of healthy food marketing [13].

The Government of Indonesia has a responsibility in regulating the domestic rice supply and price stability of rice. The unstable price of rice is the result of the price transmission process carried out by the perpetrators along the rice supply chain. The interaction of actors in the price transmission process is an important factor that often leads to injustice, even though it has been regulated in government regulations. It shows that the rice market in Indonesia is imperfect and inefficient with intermediary traders who gain excessive and unfair advantage. The critical issue with the transmission of prices and the phenomenon of determination lies in the information of unbalanced price transmission due to the supply and competition processes between actors along the rice value chain.

The government intervention in the “rice economy” is done through the rice agency in charge of implementing the government policy in the field of rice, which involves pre production, production process, and post production. One food agency assigned by the government to handle post-production activities, particularly in the areas of pricing,

marketing, and distribution is the Logistics Agency (BULOG).

Government policy can lead to the transmission of asymmetric prices that occur between levels of marketing [11]. Price changes at the farmer level relatively often will cause uncertainty for intermediary traders in determining the selling price, given the price at the farm level is the input cost for intermediary traders [25]. If such input cost changes are temporary, there is no incentive for intermediary traders to make price adjustments.

Each government in almost all countries has a price intervention policy (in the form of floor price) to protect farmers in the event of a price reduction at the farm level. Conversely, if there is a price increase at the farm level, the government will not intervene in price. This policy can indeed reduce the uncertainty of changes in costs faced by intermediary traders, but on the other hand precisely resulted in the transmission of prices from farmer level to consumer level to be asymmetric. This happens because at the time of price increases at the farm level, traders assume that the change is permanent, because there will be no government intervention. Furthermore, traders immediately adjust the selling price of the product in accordance with the price at the farm level. Conversely, if the price declines, traders consider it temporary because the government will soon intervene, so that traders will not quickly adjust the selling price. Finally there is a positive asymmetric price transmission.

Bargaining power of rice farmers

Bargaining power is a negotiation, one-sided capacity to dominate others because of its influence, strength, size, or status, or through a combination of different persuasion tactics. In the monopsony market structure at the farmer level, the trader is the price determiner [22]. In the monopsony structure, the trader will set the price equal to the average cost of farming. The price is lower than the price in the agricultural commodity market. As a result, the price of commodities at the farm level is lower than the price of the commodity at the level of perfect competition market although there is no marketing and processing costs. This situation will certainly be detrimental to farmers and will reduce farmers' income. That is because in the "monopsony" market, the trader is the price determinant, so the price at the farm level is more influenced by the pricing of traders than the market price. Thus in spite of rising prices in the agricultural commodity market, the price increase is more absorbed to the merchant's profit than the absorption to increase the income of farmers.

RESULTS AND DISCUSSIONS

Distribution chain and margin share on post harvest rice distribution in Indonesia

Efforts to improve the welfare of farmers through pricing policies and other market incentives will be effective if farmers are directly linked to the market so that they can capture the incentives. Farmers' relation to the market is important for farmer's decisions in determining the way of farming. Farmers in developing countries are often separated from the competitive market because of the share of farmed crops consumed (subsistence motives) as well as sales practices with less transparent traders, for example through slash or other non-market mechanisms [6].

In the free market period, the rice distribution pattern did not change significantly. Farmers' habit to sell their grain trimmed or through collecting traders still continues [16] [19] (Figure 4). Institutional distributions are expected to be more efficient in the free market period did not happen. The marketing channels of grain and rice remain as long as in a controlled market period.

Furthermore, related to the dynamics of marketing patterns of rice and grain in Indonesia, mentioned that in Indonesia, the average share margin is about IDR44 to IDR68 from every IDR100 paid by consumers. At the time the price tends to rise, the margin tends to rise also around IDR5 to IDR21 for every IDR100 price increase, so also when the consumer price tends to go down, the margin decreases IDR14 to IDR33 every IDR100 price drop in the consumer market [6].

To analyze the transmission of rice prices, according to the results of data processing in

Figure 1, obtained the following regression analysis results (Table 1).

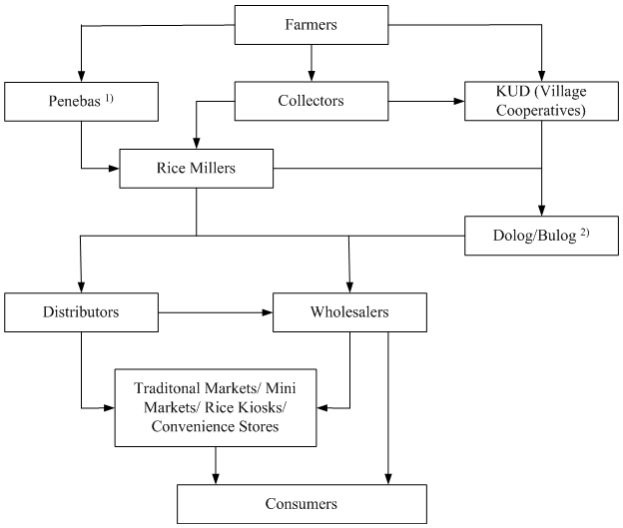


Fig.4. Distribution Chain of Post Harvest Rice (Grain) and Rice from Farmers to Consumers
(Source: Natawidjaja, 2001) [16]
Note: 1) middleman who buys crops still standing in the field and who employs his own labor
2) Bulog/Dolog is a government-owned company in Indonesia which deals with food distribution and price control,

Table 1. Regression Coefficient of Rice Price in Consumers and Producers Level

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	785.133	375.545		2.091	.105
	Pr	.355	.039	.977	9.121	.001

a. Dependent Variable: Pf

Furthermore, it can be calculated elasticity of transmission of rice price at consumer level to price at producer level.

$$E_t = \frac{1}{b} \cdot \frac{Pf}{Pr} = \frac{1}{0{,}355} \cdot \frac{4{,}189.23}{9{,}600.34} = 1{,}23$$

According to the calculation result, it is found that the value of price transmission elasticity that describes the impact of price change at the consumer level on the producer price is 1.23. The value indicates that the rate of price change at the rice retailer level is greater than the rate of dry grain (GKP) price change at the farmers level. The market faced by all market players is imperfect or uncompetitive, i.e. there is a monopoly and oligopoly power in the distribution system and the prevailing distribution system is inefficient.

Factors affecting the bargaining power of farmers on the distribution of post harvest rice in Indonesia

The weak bargaining position of farmers is one of the problems of Indonesia's agricultural sector performance. Yet as a target of agricultural revitalization, this sector is expected to create jobs, foreign exchange, Gross Domestic Product, and better food. Until now the problem of low bargaining power and declining rice prices at the farmer level at the time of rice harvest (market glut) still occur repeatedly [1]. Whereas the domestic food procurement policy that began in 1969/1970 has produced rice self-sufficiency in 1984. Ironically, the economic welfare of farmers seemed marginalized.

The complexity of bargaining power of farmers relates to conditions or factors: natural, technical, social, economic, political, whether relatively in control of farmers or internal factors as well as external factors of farmers, such as government policy. The condition of food farmers (rice) is generally apprehensive, marked by the limited level of education, farming capital, banking access, and technology used [15]. Therefore, it is important to know how far the external internal factors of farmers affect the bargaining power of rice farmers.

The concept of bargaining power which are operationally intended as the relative ability of farmers in influencing the process of selling rice transactions to reach agreement on the selling price at a rate as far as possible exceeding the minimum price desired farmers [10] [12]. In Indonesia, research on the bargaining power of farmers is still limited, even in the international arena, research on bargaining power seems to be more of a theoretical study than empirical research. The focus is mostly on the interaction of negotiation and its benefits, not the cause of the weak bargaining power of farmers [17].

An initial hypothesis can be drawn up that internal-external factors of farmers jointly influence significant bargaining power of rice farmers. Furthermore, it can be arranged working hypothesis that partially higher: the area of arable land; the quantity of rice sold;

farmers' experience of farming; or non-agricultural income, the higher the bargaining power of rice farmers. Conversely, the higher the burden of household dependents, the lower the bargaining power of rice farmers. In the meantime, rice farmers who are partially: have higher education levels; multiple employment status; able to meet its capital requirement independently; planting new varieties of rice; sell good quality rice; has a drying place; delaying rice sales; selling rice with a non-cash payment system; or sell rice based on the base price; each of which has a higher bargaining power than the farmer who has the characteristics beyond the mentioned ones. In contrast, farmers who sell rice because of the urgent need for bargaining power are lower than farmers who sell rice not because of urgent needs.

CONCLUSIONS

Farmers in Indonesia are mostly small-scale farmers, especially when grain harvest is directly sold by farmers with slash system so that the selling price is lower when compared to unhulled rice sold in dry grain conditions. Slash system is a system of selling rice in an area when the harvest. This is usually done by farmers who do not have the funds to harvest. The buyer who then proceeds to harvest.

The value of price transmission elasticity in Indonesia shows that the rate of price change at the rice retailer level is greater than the rate of dry grain (GKP) price change at the farmers level. The market faced by all market players is imperfect or uncompetitive, i.e. there is a monopoly and oligopoly power in the distribution system and the prevailing distribution system is inefficient.

There are internal and external factors that influence the bargaining power of rice farmers. The higher the cultivated land area, the quantity of rice sold, the experience of rice farmers, or non-agricultural income, the higher the bargaining power of rice farmers. Conversely, the higher the burden of household dependents, the lower the bargaining power of rice farmers.

Farmers should not sell grain immediately when the harvest, it is better that partially stored grains are stored for their needs up to 3 - 4 months ahead, so that more secure and will be able to suppress inflation. Therefore, farmers need to re-intensifies the grain storage of grain storage, so it is safer to anticipate the need for rice, given that selling grain and buying rice is not always sufficient in the market in large quantities. Further studies on the causes of inefficiency of post-harvest rice distribution need to be made in order to make distribution more efficient and share more equitable for farmers. One is to attempt to shorten the post-harvest rice distribution channel. To improve the bargaining position of farmers from a condition that tends to monopsony is to shape the farmers' institutions. Institutions that can be established such as rice milling institutions.

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BIOACTIVE COMPOUNDS AND FUNCTIONAL PROPERTIES OF SOME FLOUR COMPOSITES IN THE MANUFACTURING OF FUNCTIONAL FOOD PRODUCTS

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Abstract

Composite flour from banana corm, sweet potato, and black soybean has rich nutrition content and contains bioactive compounds, which potentially benefficial for human health if consumed in proper amount. It is important to know composite flour properties prior apply to food product. The objective of this research was to determine the bioactive compounds and functional properties of composite flour that can be applied for functional food products. The method used was an experimental method by descriptive analysis with two replications. Composite flour made by mixture of 55 part banana corm flour, 45 part of sweet potato flour and black soybean flour added as much 20 percent of the weight of banana corm and sweet potato flours. The result showed that the composite flour had bioactive compounds which contained 9.09 g/ 100g of total phenols, 1.62 g/ 100g of tannins, 171.35 mg/ 100g of isoflavones, and IC_{50} 979.64 ppm of antioxidant activity (very weak). The amylograph characteristic pasting involves initial temperature of gelatinization 76.62^{0}C, 1304.5 cP of peak viscosity, 930.0 cP of hot pasta viscosity, 1267.5 cP of cold pasta viscosity, 374.5 cP of breakdown viscosity and 337.50 cP of setback viscosity. Therefore, the composite flour from banana corm, sweet potato, and black soybean has rich nutritions to be used as functional food.

Key words**:** *amylograph, bioactive compounds, composite flour, functional food.*

INTRODUCTION

The use of wheat as raw material for food industry in Indonesia remains high, so it becomes an important problem that needs to be handled immediately. One effort that can be achieved is by reducing the use of wheat flour through some mixture of flours or often called composite flour. Composite flour is flour made from two or more foodstuffs in order to obtain characteristics which have appropriate materials for processed products, or to obtain specific functional properties.. Local commodities that are potentially upraised in the production of composite flour are banana corm, sweet potato and black soybean.

The production of banana in 2015 amounted to 7.29 million tons from 6.86 million tons in 2014, it means this production increased by 9.35%. Based on these data banana corm produced tends to increase and quite a lot, however it's not optimally utilized at recent time. On the other side, sweet potato production in 2015 is 2.29 million tons while in 2014 is 2.38 million tons; it means that was decreased by 3.57 %; and also the soybean production in 2015 is 963.18 thousand tons while in 2014 is 954.99 thousand tons of dry beans [3].

In general, banana is grown only for the fruit, and the leaf use for wrapping only. Banana plants bear the fruit only once in a lifetime, after that the trunk and corm are cut down and left-over. So far, banana corm has been only considered as waste by many people. The banana corm just thrown away and some people use it as animal feed, but it is only for some farmer. Appropriately, banana corm can be used optimally in the form of flour. The excellence of using it as flour is the carbohydrates content in the form of oligosaccharides such as fructo oligosaccharides (FOS) and gluco oligosaccharides (GOS), dietary fiber and bioactive components such as tannins [11].

Besides banana corm, sweet potato is one of the local commodities which is potential to be used as the manufacture of composite flour. Sweet potato var. Ase Kuning not only contains high carbohydrate (85.68%), but also β-carotene functions as an antioxidant and provitamin A that can be converted into vitamin A in the body.

As well as the two above commodities, black soybean can also be used in the production of composite flour to fulfill protein content (39.09%). Black soybean is one of the local commodities which is very potential to be used as functional product because it contains essential amino acids, vitamin E, saponins and rich in antioxidants such as flavonoids, isoflavones and anthocyanin [15].

That three kind flours have a good advantage of chemical properties, bioactive components and functional properties, combined into composite flour, it will have good nutritional value. The purpose of this study was to determine bioactive components and functional properties contained in the composite flour that can be utilized in the manufacture of functional food products.

MATERIALS AND METHODS

Materials

Materials used in this study were banana corm, sweet potato var. Ase Kuning and black soybean clone AKIBE-1 from Faculty of Agriculture Unpad, distilled water and sodium bisulfite, NaCl, and DPPH also chemical substances for analysis.

Research Method

Research method used was descriptive research method conducted with two replications, for each sample of the study including:

A : Banana Corm Flour
B : Sweet Potato Flour
C : Soybean Flour
D : Composite Flour

Making Composite Flour

The composite flour composition, namely mixing 45.8% of banana corm flour, 37.5% of sweet potato flour and 16.7% black soybean flour [13].

Phenolic Test with Spectrophotometer Method [1]

A total of 3 grams of each flour was put into a 50 ml measuring flask and precised with distilled water (60.000 ppm). Then, took 0.5 ml solution put into a 25 ml flask, and added 0.5 ml Folin Ciocalteu shaken for 5 minutes and added 10 ml Na_2CO_3, precised with distilled water, homogenized and let stand for 1 hour. Absorbance was measured at a wavelength of 750 nm. Gallic acid was used as standard in various concentrations.

Tannins Test with Spectrophotometer Method [1]

A total of 3 grams of each flour was added to 50 ml flask and matched with distilled water (60,000 ppm). Then, took 0.5 ml solution and put into a 25 ml measuring flask, then added Folin-denis 1.25 ml, shaken for 5 minutes and added 2.5 ml Na_2CO_3 and accorded with distilled water, homogenized and let stand for 1 hour, then absorbance was measured at a wavelength of 760 standard nm. Tanat acid was used as standard in various concentrations.

Isoflavones Analysis with HPLC Method [1]

A total of 5 grams of each flour was added into Erlenmeyar 250 ml, added 40 ml extraction solution, methanol: water (80: 20). Then, it was entered into a water bath shaker at a temperature of 65^{o}C for 2 hours. It's cooled and added 3 ml of 2 N NaOH, shaken for 10 minutes and added 1 ml of glacial acetic acid, shaken back and then removed quantitatively into a 50 ml measuring flask, then it was filtered with Whatman filter paper No. 42, pipetted 5.0 ml filtrate to 10.0 mL volumetric flask and added 4.0 ml aquabidest, matched with methanol water (1: 1) and mixed it carefully. Pipetted 1.0 ml into a centrifuge tube then centrifuge for 5 minutes at 7000 rpm. The supernatant was pipette into the vial and injected into the chromatography column

Standards used were 10 mg daidzin, 10 mg genistin, 10 mg daidzein, 10 mg genestein, 10 mg glycitein, put into 50 ml flask. Then entered the 10 mg vial glycitin to 50 mL volumetric flask, diluted with methanol until limit mark. Main standard solution was pipetted for 0.25 ml into 50 ml measuring flask and added water

methanol 1: 1 until limit mark, then it's injected into the chromatography column.
HPLC condition: HPLC Shimadzu, isocratic, sanpel volume 20 ul, column: C 18, eluent: methanol and glacial acetic acid (98: 2), detector: SPD 10A, flow rate 0,4 ml / min, temperature 25-27ºC, wavelength 260 Nm and LC10AD pump.

Calculation:

$$\text{Isoflavones(ug/g)} = \frac{(\text{Sample area} - \text{standard area} \times \text{standard concentration} \times \text{fp})}{\text{sample weight}}$$

Determination of Antioxidant Activity with DPPH Method [6]

Two grams of each flour was put into a reaction tube, and then added 0.5 ml DPPH 160 ppm (dissolved in methanol). Then the sample was homogenized and incubated for 30 minutes in a dark room and read the absorbance at 516 nm wavelength with UV-VIS spectrophotometer. Standard used was ascorbic acid in varying concentrations. The absorbance value obtained was used to determine inhibition value of sample through the following calculation formula:

$$\% \text{ inhibition} = \frac{\text{A blank} - \text{A sample}}{\text{A blank}} \times 100\%$$

Notes :
A blank = blank count absorbance
A sample = sample count absorbance
% Inhibition = percentage of free radical inhibition capacity.

The results of the calculations were included in regression equation to obtain IC_{50} values, that was the value obtained from the calculation when the percent inhibition reached 50%.

Analysis of Amilograph Characteristics [14]

Material of 3.5 grams was prepared and then inserted into a canister. Distilled water was added as much as 25 grams. The canister was put inside the tool and began taking measurements by pressing tower button. The sample was heated to a temperature of 50^0C and maintained for 1 minute. The sample was heated from 50^0C up to 95^0C then it was maintained for 6 minutes in the 95^0C temperature. The sample was cooled to a temperature of 50^0C and maintained for 3 minutes (using Standard 2).

RESULTS AND DISCUSSIONS

Bioactive Compounds

Analysis of bioactive compounds is taken to provide an overview of any bioactive compounds contained in the flours tested. The test results of bioactive compounds in banana corm flour, sweet potato flour, black soybean flour and composite flour is shown in Table 1.
The test results showed that banana corm flour, sweet potato flour, soybean flour and composite flour contained phenolic compounds.
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Three general types of phenolic compounds are flavonoids, phenolic acid and polyphenols and generally analyzed as total phenols. From the above table, banana corm flour gained the highest phenols content (9.09 g/ 100g) compared to sweet potato and black soybean flours.

Table 1. The test results of bioactive compounds in banana corm flour, sweet potato flour, black soybean flour and composite flour

Sample	Phenol Content (g/100g)	Tannin Content (g/100g)	Total Iso-flavone (mg/100g)
Banana Corm Flour	9.09	11.59	-
Sweet Potato Flour	4.00	1.32	-
Black Soybean Flour	3.03	2.23	230.56
Composite Flour	8.14	1.62	171.35

Source: Own calculation

Composite flour contained phenols (8.14 g/ 100g) lower than banana corm flour because the composite flour was a mixture of 45.8 % of banana corm flour, 37.5 % of sweet potato flour and 16.7% of black soybean flour. Banana corm contains active compounds such as flavonoids (8.18%), saponins (6.70%) and tannins (4.38%) [9]. Phenolic compounds on sweet potato act as antioxidants. Black soybean

is a food rich in antioxidants, this is caused by the presence of non oxidative components, primarily from phenols group such as isoflavones and anthocyanin pigments.

In line with the phenolic compounds, banana corm flour had the highest tannins content (11,59 g/ 100g) than sweet potato flour and black soybean flour. Composite flour contained tannins compound of 1.62 g/ 100g. Tannins are an active compound of secondary metabolite which are known to have some benefits as astringent, anti-diarrhea, anti-bacterial and antioxidant. Tannins are component of organic substance that are very complex, consisting of phenolic compounds which are difficult to separate and difficult to crystallize, precipitate protein from it solution and bound with the protein.

The test results showed that banana corm flour and sweet potato flour did not contain isoflavones, whereas black soybean flour contained isoflavones amounted to 230.56 mg/ 100g and composite flour amounted to 171.35 mg/ 100g. Isoflavone compounds on composite flour derived from black soybean flour. Isoflavones belong to the group of flavonoids and polyphenolic compounds found in many fruits, vegetables, and grains. In black soybean var. Mallika, isoflavones consist of genistin (0.65 mg/g) and daidsein (3.67 mg/g) [8]. Soybean flour and soybean grain contain isoflavone compounds ranged between 128.35 -298.95 mg/ 100 grams [7].

The resulted composite flour contained bioactive compounds such as phenols, tannins and isoflavones, it means the three
flours are complementing each others besides increasing activity value of the combination. Bioactive compounds in composite flour are antioxidant compounds, therefore the composite flour can be applied on manufacturing of functional food products.

Antioxidant Activity

The test results showed that banana corm flour, sweet potato flour, soybean flour and composite flour had a value of antioxidant activity means having the ability to inhibit DPPH radical. Antioxidants are compounds that can counteract or reduce the negative impact of oxidant. Antioxidants work by donating one electron to oxidant compounds so that the oxidant compound activity can be inhibited [17].

Table 2. Antioxidant activity of banana corm flour, sweet potato flour, black soybean flour and composite flour

Samples	IC_{50} (ppm)
Banana corm flour	422.16
Sweet Potato Flour	5418.96
Black Soybean Flour	20781.14
Composite Flour	979.64

Source: Own calculation

Antioxidants are also able to inhibit oxidation reactions by binding free radicals and highly reactive molecules subsequently the damage cells can be prevented. The highest antioxidant activity was found in banana corm flour with IC_{50} value of 422.16 ppm (weak). Antioxidant activity of composite flour had IC_{50} value of 979.64 ppm (very weak). Antioxidant activity in the composite flour is allegedly due to the presence of active compounds of phenols, tannins and isoflavones. All flour either in single or mixed form showed IC_{50} valuesabove 200 ppm. Antioxidant activity is classified very strong if the IC_{50} value is less than 50 ppm, strong if IC_{50} is between 50 –200, weak if IC_{50} is between 200-600 and very weak if the IC_{50} is greater than 600. The smaller the value IC_{50} the stronger theantioxidant activity.

IC_{50} valuesfor composite flour showed very weak antioxidant capabilities [6]

Amilograph Characteristic

Gelatinization initial temperature showed that the highest initial temperature of
gelatinization retained by black soybean flour for 95.00^0C, sweet potato flour of 80,47^{o}C, flour composite of 76,62^{o}C, and banana corm flour 50,27^{o}C. The temperature obtained is the temperature when the first time of viscosity from each flour begins to rise.

The high initial temperature of gelatinization is due to the amylose content which is higher than the amylopectin. Amylose is able to hold hydrogen bonds with another amylose or with amylopectin forming configurations that is difficult to destroy because there are many hydrogen bonds within the granules so that it requires more energy [4]. Banana corm flour

has amylose of 36.40% and amylopectin of 63.60% [13], and sweet potato flour has amylose of 16.86-21.58% and amylopectin of 20-28% [2]. Tapioca flour has high amylopectin value amounting to 83%, coincidentally banana corm flour has similar characteristics to tapioca flour.

Table 3. Amilograph characteristics of banana corm flour, sweet potato flour, black soybean flour and composite flour

Amilograph Characteristics	Banana Corm Flour	Sweet Potato Flour	Black Soybean Flour	Composite Flour
Initial Temperature of Gelatinization (°C)	50.27	80.47	95.00	76.62
Peak Viscosity (cP)	4615.00	945.00	9.50	1304.50
Hot Pasta Viscosity (cP)	2039.00	266.50	1.50	930.00
Cold Pasta Viscosity (cP)	7767.50	350.00	-2.50	1267.50
Breakdown (cP)	2576.00	679.00	8.00	374.50
Setback (cP)	5728.50	83.50	-4.00	337.50

Source: Own calculation.

Banana corm has higher amylose (36.40%) [13] than sweet potato 16.86-21.58%) [2] but the gelatinization initial temperature was on the contrary, this happened supposedly in the process of banana corm flour making, some of the starch are already experiencing gelatinization so on amilograph test for gelatinization initial temperature of banana corm flour was lower than sweet potato, soybean and composite flour. High amylose content tends to have high gelatinization temperature and water absorption level, it is due to amylose bond stronger than amylopectin bond.

The high initial temperature of gelatinization is not only affected by amylose and amylopectin but is also affected by protein and fat in the food. Soybean has the highest protein amounted to 35-38% and fat by 20% [16], and banana corm flour has protein amounted to 0.60% and sweet potato has protein content of 2.85% [13]. During heating, protein will be denatured around gelatinization temperature. Protein leads to hindrance of water migration process into starch granules thereby increases the gelatinization temperature.

High fat content may interfere process of starch gelatinization, this is because fat is able to create a complex with amylose so the amylose can not depart from the starch granules. As a result, a greater energy is required to release amylose so the initial gelatinization temperature will be higher. Meanwhile, low gelatinization temperature will be beneficial because it can save cooking energy.

Peak viscosity parameter is the ease of dough in the cooking and shows the strength of dough formed by gelatinization during processing in application of the foodstuffs. The measurement result of peak viscosity showed that the highest values were obtained by banana corm flour 4,615.00 cP, composite flour 1,304.50 cP and sweet potato flour 945.50 cP. The low viscosity peak of black soybean flour because it contains starch and carbohydrates. Consequently at the test time it did not produce gel clotting (no gelatinization), only produced a liquid looked like soymilk. A decrease in viscosity peak indicates a decline in ability of the dough to expand.

The high viscosity peak is affected by amylopectin level contained in a material, this because the branch of amylopectin structure increases the ability to bind water and form viscosity. Amylopectin is starch component which is responsible for granules expanding process [3].

Composite flour had lower viscosity peak value than banana corm flour but higher than sweet potato flour, this was due to the portion of banana corm flour in composite flour was more than sweet potato flour, so the peak viscosity of composite flour was between banana corm and sweet potato flours. Composite flour had a peak viscosity value of 1304.50 cP, it shows that the composite flour dough strength rated 1304.50 cP compared with other flours. Composite flour has much better expanding capacity than others except with banana corm flour.

Based on the amilograph characteristics on peak viscosity, it's known that composite flour had a peak viscosity of 1304.00cP, to determine whether the composite flour is suitable for food product then it is necessary to do conversion to BU unit that generated 621.19

BU. Based on amilograph properties, raw material with peak viscosity <500 BU is suitable for wet products, peak viscosity of 500-1,000 BU is suitable for wet and semi product, and peak viscosity > 1,000 BU is suitable for extrusion products (products that expand) such chiki and crackers [5]. From the above calculation, it is known that the composite flour is suitable for semi-wet products such as cookies, crackers and others.

Hot pasta viscosity is an index of the cooking easiness and reflects weakness of granules to expand. Decrease of hot pasta viscosity value is generally followed by an increase in breakdown. The breakdown viscosity is obtained from reduction of peak viscosity with hot pasta viscosity. Breakdown viscosity or decrease during the heating showed stability of pasta during the process [10]. However, at certain temperature, the decrease of hot pasta viscosity is not always accompanied by increase of breakdown. If the hot pasta viscosity and pasta peak viscosity decrease proportionally, the breakdown would likely remain.

Hot pasta viscosity showed that banana corm flour had the highest value of 2,039.00 cP, composite flour of 930.0 cP, sweet potato flour of 266.50 cP and soybean flour of 1.50 cP. The measurement result of breakdown viscosity showed that banana corm flour amounted to 2,576.00 cP, sweet potato flour 374.0 cP and composite flour 679.0 cP. Breakdown viscosity on soybean flour was the least of 8.0 cP.

Increase in breakdown viscosity value shows that the starch can not stand to heating and stirring [4]. In this research, sweet potato flour was stable on heating process, soybean flour only contributed to add protein value. Therefore, composite flour gained fair breakdown viscosity value compared with banana corm flour and sweet potato flour, this was due to the nearly balance parts of banana corm flour and sweet potato flour mixture in the composite flour. Amylopectin level affects on breakdown viscosity, this is because the structure of amylopectin branching leads to less stable against heating.

Retrogradation tendency can be seen from the cold pasta viscosity and setback. Setback or change in viscosity during cooling is obtained from the difference between the cold pasta viscosity with hot pasta viscosity. The higher the value of setback shows the higher the tendency to form a gel (increase viscosity) during the cooling. The high value of setback indicates a tendency for the occurrence of retrogradation. Retrogradation is a re-crystallization process of starch that has experienced gelatinization, while syneresis is a liquid discharge of a gel of starch [18]. During cooling, re-merging starch molecules mainly amylose will result a formation of gel structures and viscosity including cold pasta viscosity.

Cold pasta viscosity showed that cold pasta viscosity of banana corm flour was the highest, followed by sweet potato flour then composite flour (Table 3). The increase in viscosity during the cooling determine the tendency of starch re-merging which reflects tendency of product to retrogradated [12].

Banana corm flour had a setback viscosity of 5,728.50 cP, followed by composite flour of 337.50 cP, sweet potato flour of 83.50 cP. Setback viscosity value in soybean flour was -4 cP, this is due to the absence of peak viscosity, consequently the setback viscosity value can not be calculated.

Banana corm flour gained higher setback viscosity value compared to others. It shows that the retrogradation process is getting stronger. Soybean flour had the lowest setback viscosity, it indicates that soybean flour is difficult to experience the retrogradation process after cooling. Setback viscosity is the parameter of recrystallization of gelatinized starch during the cooling.

CONCLUSIONS

Composite flour, banana corm flour, sweet potato flour, and black soybean flour produced had bioactive compounds such as phenols, tannins, and isoflavones. The composite flour had bioactive compounds which contained 9.09 g/ 100g of total phenols, 1.62 g/ 100g of tannins, 171.35 mg/ 100g of isoflavones, and IC_{50} 979.64 ppm of antioxidant activity (very weak). The amylograph characteristic of

composite flour involved initial temperature of gelatinization 76.62^{0}C, 1304.5 cP of peak viscosity, 930.0 cP of hot pasta viscosity, 1267.5 cP of cold pasta viscosity, 374.50 cP of breakdown viscocity and 337.50 cP of setback viscosity. From bioactive compounds and functional properties, the composite flour is suitable to be used in the manufacture of functional food such as biscuits, cookies and others.

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STUDY ON THE MORPH-PRODUCTIVE CHARACTERISTICS OF FRENCH ALPINE BREEDS EXPLOITED IN SOUTH-EAST PART OF ROMANIA

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Abstract

The paper aim was to present a study on how to adapt the French Alpine breed type semi-intensive farms in the South of Romania on: body measurements and basic conformation indices, indices breeding base and production perfomances related to the growth and the quality and quantity of milk from the farm of Balta Doamnei, Prahova County. Body measurements carried out have revealed the following average dimensions: live weight 58.41±0.29 Kg, as an average, withers height 69.65±0.29cm., Height at the crupper 71.46±0.38cm, Oblique body lengt 77.60±0.28 cm, head length 20.50±0.014 cm, head width 13.47±0.18 cm, chest width 20.82±0.25 cm, croup width 19.89±0.14 cm, thoracical perimeter 92.21cm±0.32 cm and cane perimeter 9.42±0.053 cm, conformations corresponding to a typical characteristic of milk with a slight skin dual skeleton developed a strong profile with rectangular top line upward anterior-posterior head fine and confirmed data also found in corporeal indices determined. Milk production is 487.38 litters with a rather large variability between 337 l and 615 l maximum of about 2.3 l / day for an average of 212 days of lactation debut in November with 56.7 ± l, 26 l, with the slow progress of the lactation curve with a peak in February 100.41 ± 3.81 CV = l with a 23.42, followed by a decrease until the 7th month respectively in most 43.28± 1.52, its further performance to be stimulated both by selection on behalf of the mammary gland morphology and sanitation as well as to yield cheese milk protein, respectively.

Key words**:** *production, somatometrychal measurement*

INTRODUCTION

In the last twenty years Romanian farmers who wanted exploitation goats were interested more and imported from different European countries a lot of specialized breeds especially for milk, like Saanen, Alpine French, AngloNubian, Murciana-Grandina, and Boer for meat, and even Angora for mohair. The foundations of modern goat growth have been laid.

Obviously some of these breeds were crossed with the native local breeds, whose crossbred did some performance comparable to the maternal and paternal breeds with the requirements of the crossbred of the Carpathians. This breeds are otherwise well adapted to the local geo-climatic extensive holdings in mixed populations with sheep and goats.

According to FAO statistics goats herd development situation presents somewhat differently, both regarding the number of animals as well as the consumption of milk or goat meat at world and European level [12].

Thus, in the year 2000, the top on goats livestock was owned by Asia with 458.52 million heads followed by Africa with 236.82 millions heads, Oceania with 2.39 million heads, Europe with 18.94 million heads, EU-28 with 14.5 mil heads, America 34.9 million heads from a total world of 751,630,000 heads of goats. In 2013 goats livestock shows somewhat a different situation, 597.15 milion heads in Asia, Africa with 351.97 million heads, Oceania with 3.97 million heads, Europe with 16.48 million heads, EU 28 with

12.41 million heads and America with 36 million heads from a total of 1,005.60 million goats heads [12]. There are certain evolutionary trends only to other continents, except Europe. In Europe and in the EU-28, it shows a major decline of the herds from -12.95% in the first case to 14.46% in the case of EU-28. This decline in goat herds in the European continent continued in the coming years, which is a worrying phenomenon.

In contrast it shows a major increase in other continents such as Africa, approx.+ 48.6%, Asia + 30.23%, Oceania, + 65.76% , America + 3.13% and an evolution of + 33.79% global average in this period (Fig 1).

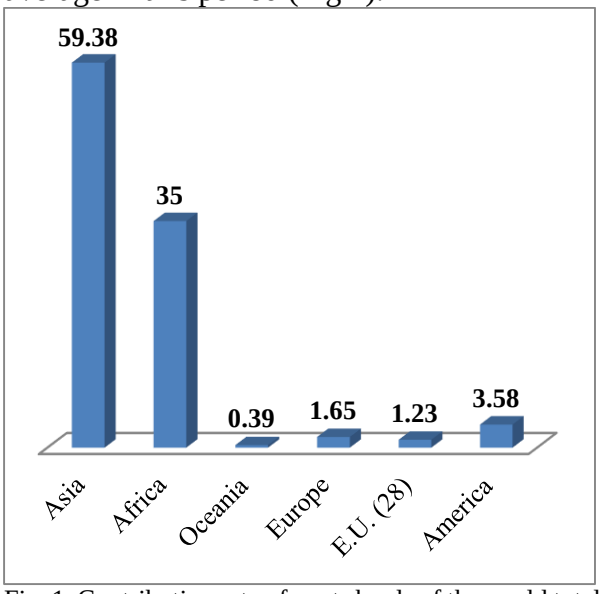

Fig. 1. Contribution rate of goats herds of the world total in 2013 (%) (own design, 2017)

The biggest actual world its goats herds it has Asia with approx. 597,151,616, respectively 59.38% with China in the first place which held in 2011 cca.142.23 million, about 18.9% of world total herds (FAOSTAT) and in 2013 approx. 182.3 million heads, followed by India with 126 million heads goats, Pakistan with 56 million heads, Nigeria with 54 million heads, and Bangladesh with cca. 56 million heads and others. This breed is found where goats provided by adaptive plasticity and less demanding food, minimal protein intake, even vital to human resource poor food, especially in rural areas as Asia and Africa. [12] [13]

At European level, and especially at EU-28 level, between 2000 and 2013, we noticed a decline of approx. 15%. (Fig.2). After Romania's accession to the EU, Romania ranks 4th place after Greece, Spain and France (Fig. 3). In the last 3 years, we are witnessing the reversal of the last two states, and Romania is ranked 3rd place based on the number of goats in possession (Fig. 3).

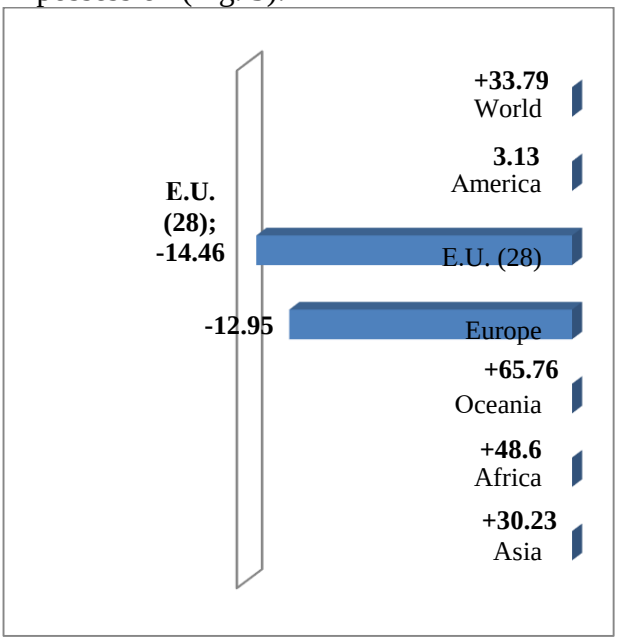

Fig. 2. The descending trend of goats between 2000-2013 (change in %) (own design, 2017)

Starting with 2015, the goat sheep population of the EU28 had a ranking in which Romania passes on 3 place but also with most livestock holdings. The owners have very small households or family farms, where production is for self-consumption.

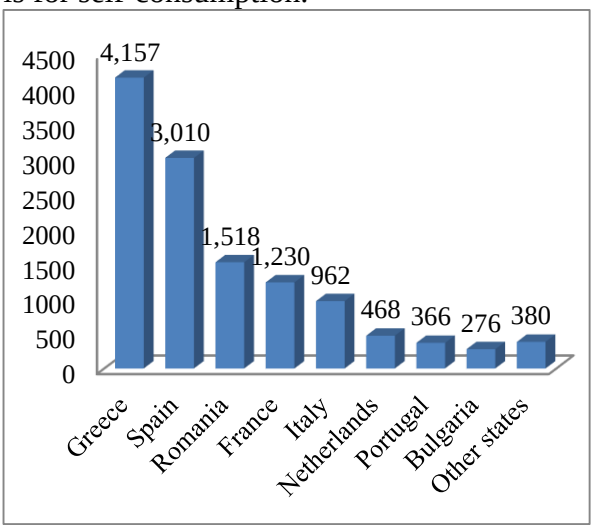

Fig. 3. The evolution of goats in last ten years in first 4 European states, 000 head (own design, 2017)

In Romania according to M.A.D.R. source of December 2016, goats total number was 1.9 million. [11]

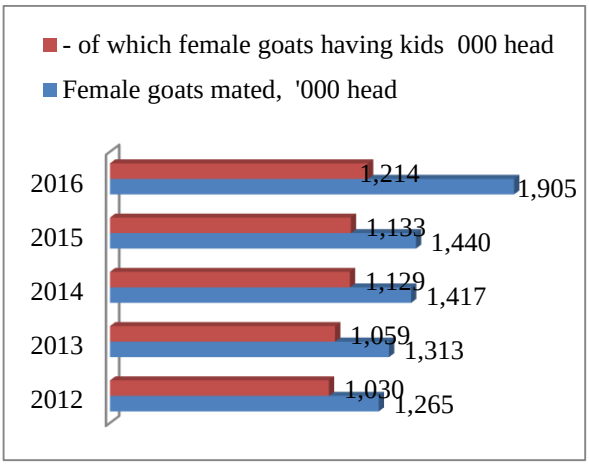

Fig. 4. The evolution of goats herds in last years, 000 head, (own design, 2017)

Global goat milk production has seen an upward trend. Thus, world production in 1990 was 9,980,102 tons and in 2012 it was 17,846,118 tons in which the leader is the Asian continent with 10,410,137 coming mainly from the above mentioned states with a share of about 52% of the world, followed by Africa 22%, Europe 13% and EU 28 10%, America 3% and Oceania 0,04% respectively 48 t (Fig. 5).

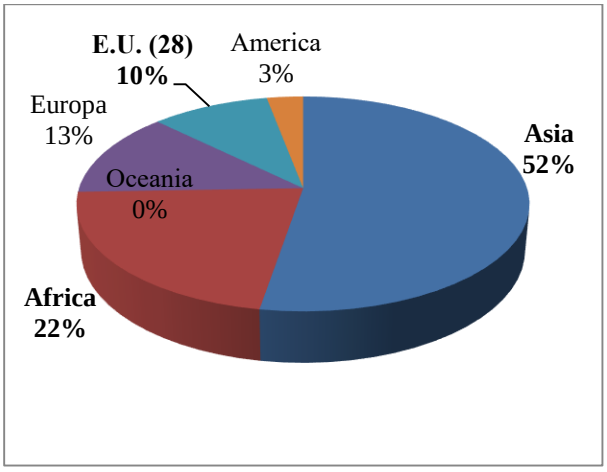

Fig.5. Global contribution of goat milk of total% (Own design, 2017)

Consumption of goat milk as well as meat is usually directed towards continents and developing countries where there is a vital requirement to cover the food of numerous and poor families as a source of protein or in those where top processing or milk preparations form goats are popularized and/or used for specific cheeses in the EU states, such as France, Spain, Italy, the Netherlands, etc.

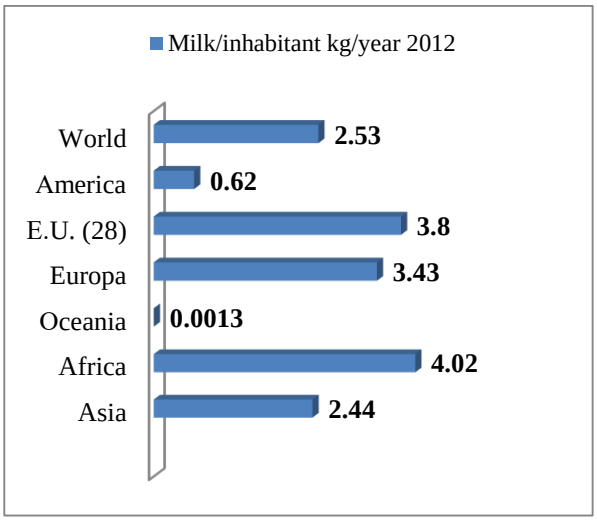

Fig. 6. Goat milk consumption/inhabitant at the world level in 2012 (own design, 2017)

For example, only France produced in 2007 approx. 438,000 t of goat milk collected from approx. 1.3 million heads. In countries such as the Netherlands, Spain, Austria, Italy and Germany, goat breeding has reached other technical and economic parameters, superior to the African situation or perhaps other of European countries.

In Romania, there are mixed holdings farms in which goats are seep are kept together in small or large flocks on the pasture. There are also goat farms, extensively exploited, in over 85% of the goats herd. But there are farms that exploit semi-intensive goats, as is the case with the farmer analyzed. Although they have imported breeds, they can't be considered intensive farms, for other reasons such as holding, feeding and milking. These farms hold over 5-6% of the Romanian herd. Another group is that of farms that exploit specialized breeds and hold farms similar to Western ones. The purpose of the paper was to study how to adapt the French Alpine breed type semi-intensive farms in the South of Romania. In this purpose, there were madeivestigations on: body measurements and basic conformation indices, indices breeding base and production perfomances related to the growth and the quality and quantity of milk from the farm of Balta Doamnei, Prahova County.

This study was conducted on Mr Cojocaru Ovidiu's farm on a flock of 68 goats from the French Alpine breed imported in 2010.

MATERIALS AND METHODS

The biological material subjected to the analyzes was represented by goats from the Alpine breed on the farm in Balta Doamnei Commune, Prahova County. The first determinations focused on the prolificacy, the weight of the females, the growth increases and lactation control, respectively the chemical composition of the milk, determined with the help of the milk-scanner [1].

Subsequently, body measurements were performed with the help of specific instrumentation and body indexes were determined [5,6]. For the determination of the quantitative milk production, milking machines were used with debitmetry.

RESULTS AND DISCUSSIONS

Goat determinations reveal a phenotypic peculiarity that allows comparison with specific breed typology, and in particular how high performance breeds can evolve under the effect of climate adaptations. These breeds can only allow in certain situations to obtain off-season milk production compared to the Carpathian, rustic, indigenous breed. [9] A similar inception study was made in 2012 on newly imported biological material on the holding in Gîrbov-Ialomița and was published in 2014, which tried to highlight the adaptive character of the Alpine performance, but subjected to modest exploitation, the results have were similar. [6]

These animals were imported for the purpose of semi-intensive exploitation but also for the sale of male products. They held certificates of origin and were subsequently used for the quantitative and qualitative improvement of milk in the native breed. They were also used to improve the morphological performance of the nipples, namely the milking rate and the ease of mechanical milking in Carpathian breed.[1,4]

In this work, 68 shepherds from the Alpine breed were subjected to zootechnical analyzes, keeping a good structure on the number of lactations.

Somatometric measurements

Body measurements have demonstrated some variability within the same age classes or physiological states, with the following average dimensions: Live weight 58.41 ± 0.29 Kg, Withers height 69.65 ± 0.29cm, Height at the crupper 71.46 ± 0.38cm, Oblique body length 77.60 ± 0.28 cm, Head length 20.50 ± 0.014 cm, Head width 13.47 ± 0.18 cm, Chest width 20.82 ± 0.25 cm, Croup width 19.89 ± 0.14 cm, Thoracic perimeter 92.21 cm ± 0.32 cm and Cane perimeter 9.42 ± 0.053 cm. Thus, body indexes are: IFCl = 111%, I.Ma = 118%, I.O.sub.1 = 13.15, ID = 10.0%, I.Dif.Hn = 102% %, I. Pro = 90.2%.

These correspond to a characteristic milk conformation, but with a slight dual tendency, with a developed skeleton, rectangular profile, with an upwardly ascending upper line, having a fine head, with good proportionality. Regarding the body weights that show a certain variability and associated with the determined increases, a very good precocity of the goat youth can be found, limiting the reproductive age of the female youth.

Females prolificacy

The prolificacy of the Alpine females is 139%, although there is a tendency for all female obtained from the twins to be retained to replace the reform group, the tendency was to reduce this percentage, which is also influenced by breeding goats. Inbreeding is considered as a delicate point in both goat and sheep farms.

Evolution of the young goats

The appreciation of the breeding process of the Alpine breed of young goats has allowed some assertions to be made about the precocity of the breed. Thus, it can be noticed that females under one year can be introduced into reproduction because they can reach weights of over 42 kg at approx. 10 months, which represents over 70% of the adult weight of the breed. [6]. Although there are differences in growth rates at different stages of growth, with

gender differences of over 17%, which can also be found in twins.

In the first month of life, the increase to males is 167 g, and to females of 156 g, in close correlation with the weights at birth and the type of calving. In the second stage, where weaning takes place, it is necessary to administer a special zoofort supplement, which allows both post-lactate stress recovery and subsequent recovery. This is the only way to achieve this performance of 196 g at males and 168 g at females and a slight decrease in the 3rd stage with approx. 15-17% of the increase of 0.166 g and 0.156 g of female. Thus, more intense increases in both sexes can be observed in the 2nd stage, with the development of digestive equipment and especially enzymatic, which ensures fast and concentrated feed consumption, as well as earlier ruminant stimulation. This fact was also observed in other farms with performing animals of the same species [5,6]. (Fig. 7.)

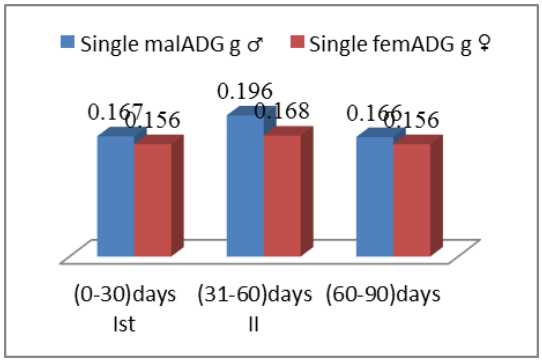

Fig. 7. The evolution of body weight in relation with ages of young goats Alpina (own design, 2017)

Production of goat milk

Milk is the main production yield under the control of milk production under the coordination of Caprirom. Thus, the average daily milk production is 2.3 l/day but not well above the previous study performance of only 2.19 l/day, for an average lactation period of approx. 212 days. [6] They produced a larger quantity of milk with an average of 487.38 liters, but with a fairly large variability ranging from 337 l to a maximum of 615 l. In this context milk production over a winter- the spring, recognized as an extra season, offers the possibility of its superior net capitalization and thus has another market share, practically double. This demonstrates good potential but also a lack of selection and orientation especially on breast morphology. Food, comfort, and mechanical milking, conform to physiological requirements, and do not make it difficult to achieve productive performance. In such farms, another type of youth marketing is also envisaged, especially as all products are retained, which can then be better harnessed. This strategy applies to farms that hold imported biological material of origin. [5], [6]

The average performance in calendar months shows a modest, slow-onset lactation. Starting November, an average of 56.7 ± 1.26 liters is produced, in December 68.74 ± 1.46 liters with a C.V. 13.12%, in January 81.92 ± 1.7 l liters, in February 100.41 ± 3.81 l with a CV = 23.42, in March 75.61 ± 2.07 liters with a CV = 16.88%, in April 59.74 ± 1.65 l with CV = 17.07%, more 43.28 ± 1.52 l with CV = 21.69%. These productions show some performances, but not enough compared to the average of the breed. Variability quite pronounced, especially in the months with higher productions, shows the need for greater pressure on selection, especially on certain characters. Future genomic selection will be faster and safer. [2]

Lactation curve

Average performances during lactation show a moderate lactation onset, with a slow progression in the first 3 months of lactation and a peak nearly in the 4th month, with a decrease to 7th month or May, performance further selected and stimulated by any managerial means. The analyzed sample has almost a curve somewhat identical to that of the breed but with a slow decrease, which can be extended to lactation (Fig. 8).

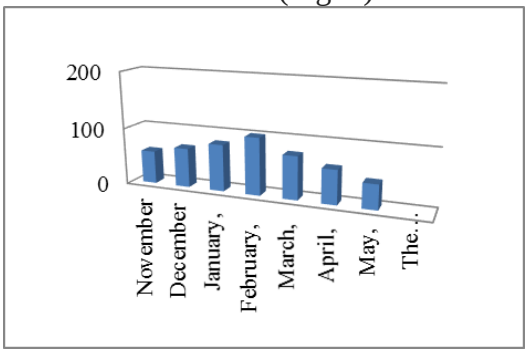

Fig. 8. Variations in the lactation curve of the Alpina French breed (own design, 2017)

Chemical composition of milk

The tendency towards a certain variability of the chemical elements of milk has been demonstrated in several papers. Thus the dairy protein variation is good, ranging from 3.2 to 3.6% and the fat between 3.1 and 4.0%, based on a typical diet of stock but also on the rationally concentrated intake. [2] (Fig. 9).

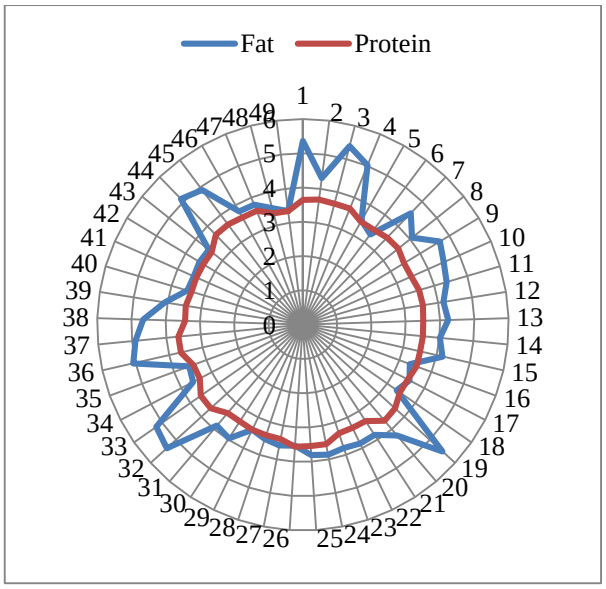

Fig. 9. Variation of fat and protein in milk of Alpina breed (%). (own design, 2017)

The presentation of the monthly averages in the above histogram demonstrates that the selection for milk protein in particular, which has a major influence on the yield of cheese production, can be continued.

The factor analyzed on the holding has good operating conditions. Attention is paid to details of the specific requirement of the breed, age, physiological status, feeding. Also, maintenance and assurance of technical comfort, treatments and/or prevention as appropriate, behavior, supervision, etc. are also considered. all of these are part of the optimal farm management, based on race experience. Processing takes place on the farm, and distribution solutions are sought through short chains, typical of farms that grow productive breeds.

A major role in product valorization and purchase of inputs on the farm can play the associative forms of the species or product. They come to complement both through experience, debates, case studies, impact studies, or analyzes, and can solve some of the problems encountered. These can be clarified together because new problems arise and there is a great need for specific technical advice with various "actors" on different areas of modern goat exploitation.

From a genetic point of view alongside recognized mammalian morphology indexes, there are a number of combined indexes linked to integrity or health, as well as immunological or combined resistance, as it is called. There are 11 indexes of breast morphology in genetic selection.

Thus, according to the European context, especially the economic and climate context, the need for a detailed study is related to genetic variability, which refers to new characters not only of production, resistance or even parasitology, but also the productive durability or longevity of the new genotype.

CONCLUSIONS

Milk production is also considered modest this time, of only 487.38 liters, with a rather large variability of 337 liters, almost as the local rustic breed and the maximum of 615 l, which we can say is close to the ones in country of import. The production of 2.3 l /day for goats and the 212 days of lactation gives us indications that they can be programmed for reproduction.

These extracts and the typology of the lactation curve require a rigorous selection on the basis of both the morphology of the mother and the level of protein and fat, which are also valid for Alpine megacities of the native breed. They seem to have better resistance or plasticity that gives performance on farms in the country.

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DETERMINANTS OF YOUTH PARTICIPATION IN FOOD CROPS PRODUCTION IN SONG LOCAL GOVERNMENT AREA OF ADAMAWA STATE, NIGERIA

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Abstract

The study examined the Determinants of Youth Participation in Food Crops Production in Song Local Government Area of Adamawa State, Nigeria. The specific objectives were to describe the socio-economic characteristics of the youth, examine the determinants of youth participation in food crops production and identify constraints faced by the respondents. Data were collected with the aid of a structured questionnaire administered to 121 randomly selected respondents. Analytical tools used in the analysis of data were descriptive statistics and logit regression. Results showed that 55.38 %, of the respondents were in the range of 18 – 29 years with mean age of 27 years, 58.68% were married with the mean household size of 3 people respectively. Also, 95.87 % were literate and attained one form of formal education or the other with mean annual income of ₦185,911. Furthermore, 87.60% participated in food crops production, 71.69 % of the respondents had 1 to 5 years of experience with mean farming experience of 7 years, 75.47 % cultivated less 3.44 hectares of farm land with an average farm size of 2.5 ha. Logit regression result revealed that 82.27 % of the variations in the participation of youths were explained by the variables in the model. Marital status, farm size, income and education were the major determinants of youth participation in food crops production. Inadequate capital, poor government attention on agricultural sector, poor roads and rural infrastructure and inadequacy of inputs at the right time were the major constraints to youth participation in food crops production. Agricultural sector be given priority attention by government, re-introduction of subsidy on inputs and formation of viable cooperative groups to facilitate access to farm credit were recommended in the paper.

Key words: *Youth participation; Food Crops production, logit Adamawa State*

INTRODUCTION

In Sub Saharan Africa, agriculture suffered a relative neglect in terms of government expenditure and volume of developmental assistance for two decades. The sector is seen to play a key role in poverty reduction and food security with great potential for impacting on nutrition and unemployment, but who wants to farm?[19]. Factors pushing many nations to pursue national policy goals on food security include the rising unemployment among the youth, the dwindling prospects of the sector where much of the World's food is produced by conservative ageing small-scale farmers [12]. Young people constitute a high and increasing population of the African continent with around 70 percent of the total population under 30 years[16]. According to International Labour Organization, [15], 60% of African unemployed people are youth. Nigeria is largely an agrarian society and like many countries of Sub-Saharan Africa, it has a predominantly young population much of which resides in the rural areas. The current Nigerian unemployment rate remain high at 19.7% with the youth accounting for 75 %, about three times the average for Sub-Saharan African countries and the global average of 12% [20].

Agriculture possess significant untapped development and employment creation potential, but despite this ample potential to provide income generating opportunities for the youth, challenges related to their participation in this sector and more importantly, options for overcoming them are not extensively documented [12].

Participation defies a single definition; it is the act of taking part in an activity or event, it is the process during which individuals, groups and organizations are consulted about or have

the opportunity to become actively involved in a project or programme of activity. The term is premised on the basic need approach and varies according to the perspective applied, this study adopted the social movement perspective which identified participations primary goal as one of a process which an individual or group involves in an activity or event from a thorough, conscious decision making process to handle challenges and influence the direction of their own lives. An empirical study of youth's involvement in food crops production is necessary because the agricultural sector is at risk, it is confronted with a critical need for new hands and use of modern techniques of farming over the current ageing farmer population that is fast depleting and the youths who are supposed to replace them are either withdrawing or reluctant to go into farming as a profession, [6].

The term 'youth' is often understood to be the period of transition from childhood to adulthood encompassing process of sexual maturation and growing social and economic autonomy [16].

For operational purposes the term is usually defined with reference to age bracket; the United Nations Organization, UNO applies the age bracket of 15 to 24 years for their work on youth, the Commonwealth uses 15 - 29 years while Nigeria uses the age category of 18 - 35 years [21], [23].

Literature on the socio-economic characteristics of youth indicates a prevailing trend by which rural youth assumes adult responsibilities much earlier than their urban counter- parts.

Youth in food crops production has not been a popular subject for review in the past, current interest is stimulated by the compelling need to solve the ever increasing rate of youth unemployment [3]. A study by Adebayo, (2010) [2] on Constraints to Participation in Income Generating Enterprises among Youth in Birnin-Gwari Local Government Area of Kaduna State, Nigeria revealed that most of the participants were male with only 40 % in full time participation while 60 % participated part time. Age, sex and extent of participation were the significant variables influencing participation in agricultural activities. Inadequate capital, poor storage facilities, high price of inputs, poor market outlets, absence of good roads and land tenure system as some of the major constraining factors to youth participation in agricultural activities; other factors include inadequate credit facilities, poor return to agricultural investment and lack of insurance for produce during glut or natural disaster and negative perception on farming as some of the major problems hindering youth's involvement in agricultural activities[14].

Young people in Africa are increasingly reluctant to pursue agriculture based livelihood due to a combination of factors including the de-skilling of rural youth, the downgrading of farming and rural life, the chronic neglect of small scale agriculture, rural infrastructure and the problem that young rural people increasingly have in getting access production resources while still young[24].

Considerable researches conducted in Africa on youth revealed that only 6 % addressed agriculture, livelihood and unemployment or child labour[19]. In Nigeria, data on rural youth participation in agriculture are scarce, the few studies available on food crops production focused mainly on their parents while the youths who constitute a large proportion of the productive force were neglected [9]. This dearth of data on youth production activities leaves a huge gap which necessitates this study on Determinants of Youth Participation in Food crops production in Song Local Government Area of Adamawa State, Nigeria. The specific objectives were to describe the socio-economic characteristics of youth in the study area; examine determinants of youth participation in food crops production and identify constraints faced by respondents in food crops production in the study area.

MATERIALS AND METHODS

The study was conducted in Song Local Government Area of Adamawa State, Nigeria. It is situated in the North-eastern part of the state and shares boundaries with Gombi and Hong Local Government Areas to the north, Maiha to the east, Girei and Fufore to the south

and Demsa and Shelleng Local Government Areas to the west. It has (6) districts namely, Zumo, Song, Mboi, Waltadi. Suktu and Ditera respectively.The people of the area are predominantly farmers with significant number engaged in trading. The major food crops grown in the study area are maize, cowpea, sorghum, millet, rice and cassava [1]. The data were collected from primary source and were obtained through the aid of structured questionnaire administered to the respondents in the selected communities of the study area.

For the study, three out of the six districts of the Local Government Area were selected purposively due to high agricultural production activities.

From each of the three districts, three villages were selected based on high participation in food crops production activities. A list of 458 youth was obtained from the village youth leaders in the nine villages out of which one hundred and thirty (130) were randomly selected in proportion to their population in each of the villages; however 121 of the questionnaires were returned and used for analysis. Data collected were analyzed using descriptive statistics and inferential statistics (Logit regression). The descriptive statistics was used to address objectives (i) and (iii).The logit regression model was used to analyze objective ii of the study. Logit regression is a qualitative response model used widely to investigate factors affecting an individual's choice from among two or more alternatives [11], [23]. The model is specified as:

$$Pi = P(Y = \frac{1}{Xi} = \beta 0 + \beta i Xi, \mu i$$
$$= 1,2 \ldots . n \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (1)$$

where:

$Pi = P(Y = \frac{1}{Xi}$ is the probability of the i^{th}youth participating in food crops production and

$Y = 1$ means participation; $Y = 0$ means otherwise

Xi = explanatory variables,

β_0 = the intercept

βi = the corresponding coefficient and

Ui = error term

n = sample size

Variables and their expected coefficients is contained in Table 1.

Table 1. Variables used for the Logit Regression, their Units and expected Signs

Variable		Unit	Expected sign
Dependent variable	(Y)	Dummy 1 = participated, 0 = otherwise	
Primary occupation	(X_1)	1=farming, otherwise=0	+
Marital status	(X_2)	1= married, 0=otherwise	+
Education	(X_3)	Years of schooling	+
Household size	(X_4)	number of people	+
Farm size	(X_5)	Hectare	+
Income	(X_6)	Naira	+

Source: Field survey 2016

RESULTS AND DISCUSSIONS

Socio-economic Characteristics of Respondents

Socio-economic characteristics of any society helps in understanding the type and nature of their livelihood and social life for ease of decision making [13]. The results in Table 2 showed that 55.38 %, of the respondents were in the range of 18 – 29 years, 44.63% were in the age bracket of 30 - 35 years with mean age of 27 years respectively. The result revealed that respondents were in their active years an advantage for providing quality labour as they are more efficient in labour tasking jobs, and have greater propensity and willingness to explore new ideas, concepts and technologies. The result is in agreement with the works of [5], [22] and [18] and who reported the propensity of young farmers to technology adoption of innovations in agriculture. The result also revealed that 58.68% were married, 39.66 % were single and 1.65% were divorced respectively. The high participation in food crops production by married youth can be attributed to the concern for household welfare

and food security following marital responsibilities. Youth especially those from rural areas enjoy earlier and greater involvement in work roles and have opportunity of becoming economically independent earlier than their urban counterparts [17]. On household size, 81% of the respondents had 1 to 5 persons and 19% had above 6 people with the mean household size of 3 people. The moderate household size might be that, respondents were still young and relatively have few dependents. Educational level of respondents revealed that 95.87.% were literate, with those who had post-secondary education accounting for 52.89%, secondary education (38.01%), 4.97% had primary education while 4.13% had no formal education. This implied that most of the respondents had moderate knowledge necessary for understanding modern farming techniques, adoption of innovations and application. The income distribution of respondents as shown in Table 2 revealed that majority 49.58% had income ranging from ₦300- ₦400,000, and 33.88% earned less than ₦ 300,000 income, while 16.52% had income above ₦400,000. The mean income of the respondents was ₦185,911, an indication that the respondents derived some economic benefit which helped in sustaining their livelihoods.

Table 2. Socio-economic characteristics of Respondents

Variable	Frequency	Percentage	Mean
Age			
18 -23	25	20.67	
24 – 29	42	34.71	
30 – 35	54	44.63	27
Marital status			
Married	71	58.68	
Single	48	39.67	
Divorced	2	1.65	
Total	**121**	**100**	
Household size			
1 -5	98	81	
6 – above	23	19	3
Total	**121**	**100**	
Educational level			
Non-formal	5	4.13	
Primary	6	4.97	
Secondary	46	38.01	
Tertiary	64	52.89	
Income in Naira			
<300,000	41	33.89	
300 – 400,00	60	49.58	185,911
400,000 – above	20	16.53	
Total	**121**	**100**	

Source: Field Survey, 2016

Participation in Food Crops Production by Respondents

The distribution of respondents based on participation in food crops production is shown in Table 3 indicated that 87.60% participated in food crops production and 12.40% of the respondents did not.

The high participation may be due to quick turn over from crops production partly as a result of early maturing varieties and ready market for crop produce.

The result conforms to [8] and [14] who reported youth who were engaged in farming were mostly involved in food crops production. On farming experience, the result showed that 71.69 % of the respondents had up to 1 to 5 years of experience, 28.31 % had above 6, with the mean farming experience of 7 years.

This may be attributed to the fact that most of them have rural farming background and had noted economic benefits derived from farming from their parents. Farm size distribution of the respondents showed that 75.47 % cultivated between less than 1 to 3.44 hectares of farm land while25.53% cultivated above 3.5 ha with an average farm size of 2.5 ha.

This study showed that youth participation in food crops production was on small-scale basis.

Determinants of Youth Participation in Food Crops Production

Factors influencing youth participation in food crops production was evaluated using Logit regression. VIF test result and estimated logit result with Diagnostic statistics are contained in Tables 4 and 5.

The estimated VIF with respect to each variables was greater than unity but less than the threshold level of 10 (Table 4).

The result suggests that the explanatory variables specified in the model do not cluster together or exhibit multicollinearity tendencies. This implies that the estimates of the model to an appreciable extent are consistent and unbiased, stable over time.

Table 3. Respondents participation and associated Characteristics

Variable	Frequency	Percentage	Mean
Participation in food crops production			
Yes	106	87.60	
No	15	12.40	
Total	**121**	**100**	
Farm experience(years)			
1 -5	76	71.69	
>6	30	28.31	7
Total	106	100	
Farmsize in hectares			
<1	17	16.04	
1.5 – 2.44	23	21.69	
2.5 – 3.44	40	37.74	2.5
3.5 – 4.44	17	16.04	
4.5 – above	9	8.49	
Total	**106**	**100**	

Source: Field Survey, 2016

Table 4. Variance Inflating Factor(VIF) Test Result

Variable	VIF estimate
Primary occupation	1.085802
Household size	1.434467
Farm size	1.466137
Literacy	1.156370
Income	1.120925
Marital status	1.256062

Source: Field Survey, 2016

The diagnostic statistics of the estimated model (Table 5) revealed that the loglikelihood ratio of 9.8982228 is significant at 1% probability level. This indicates that the specified logit model has a strong explanatory power. The pseudo R^2 of 0.8227 showed that implying that 82.27 % of the variations in the dependent variable were explained by the variables in the model. Furthermore, Hosmer- Lemeshow test was not significant (model is correctly specified), goodness of fit was also significant and the model correctly explained 97.52%.

All the estimated coefficients carried the expected positive signs, all the variables except occupation were statistically significant at various probability levels. Marital status was significant at 10%level and a unit increase will increase the odd of participation by 3.825%.

Marriage imposes the responsibility on household heads to cater for the needs of their families in the provision of food, shelter and clothing. Food crops production provided for such opportunity in the study area. Productivity and the efficiency of the

household through couples' specialization in specific skills and duties in addition to the fact that married couples may be more easily able to draw on relatives for help like farm credit. The findings is in tandem with [4], [7] and [23]. The coefficient for education was significant at 5%. A unit increase in education will increase participation by 20.51% in food crops production by youth holding other factors constant. The explanation for this might be that, the farm serves as a platform to practice theoretical knowledge acquired from schools. Household size was positive and significant at 1% and increases participation by about 4.08%. A large household will mount pressure on a responsible youth to participate in food crops production for family food security, income and other social requirements. The result agreed with [10] and [7]. Farm size was significant at 5% and increases participation in food crops by 48.09%. Farm size has been found to be a critical factor in production and adoption of technologies in agriculture. This implied that a youth with larger farm size is expected to obtain higher income from their productive activities. Similarly, a youth with larger farm size stands a greater chance of access to farm credit and getting more income. The result lay credence to the findings of [18] who reported that land is a critical factor of production among smallholder food crops farmers in Adamawa State. Income was significant at 5% and has the potential to increase participation by 25.19%. Technologies developed are capital intensive and farmers with sufficient income can purchase inputs and expand their scope of production than those with low income. The explanation for this might be that a reasonable proportion of income from food crop production would serve as a sufficient inducing factor in absence of a viable alternative. This finding conforms to [23], who reported that most youths participate in farming activities as the last alternative to earn income.

Table 5. Estimate of Logit Regression on Determinants of Youth participation in Food crops Production

Variable	Coefficient	Standard error	Marginal effect	Z - values
Primary occupation (X_1)	0.0000622	0.0000879	3.21e-09	0.71
Marital status (X_2)	7.415602	4.303626	0. 03825	1.72*
Education (X_3)	0.3974259	0.1765123	0. 20513	2.25**
Household size (X_4)	0.7890218	0.2943665	0. 04075	2.68 **
Farm size (X_5)	6.389776	2.744929	0. 48095	2.33**
Income (X_6)	0.486538	0.2482654	0.25194	1.96**
Constant	-18.3093	7.055263	-	-2.60**
Diagnostic statistics				
Log likelihood = 9.8982228				
Pseudo R^2 = 0.8227				
LR chi2(6) = 91.88***				
Specification test				
_hat	1.033981	.3345732		3.09***
_hatsq	.055712	.0543866		1.02
Goodness-of-fit test				
Pearson chi2(114) = 27.40***				
Correctly classified : 97.52%				

Source: Field Survey 2016 *** 1 % significance, ** 5 % significance, * 10% significance

Table 6. Distribution based on constraints to participation in food crops production

Constraints	Freq.	Percentage	Mean
Inadequate capital	86	81.13	0.8113
Poor government attention on the agriculture sector	76	71.69	0.7169
Poor rural roads / infrastructure	59	55.66	0.5566
Inadequate inputs at the right time	57	53.77	0.5377
High cost of inputs	52	49.06	0.4906
Poor market outlet for produce	44	41.51	0.4151
Pest and diseases infestation	38	35.85	0.3585
It is energy-sapping	30	28.30	0.2830
Inadequate knowledge of modern crop production process	28	26.42	0.2642
Low respect for farmers by the society	24	22.64	0.2264
Inadequate land	23	21.70	0.2170
Grand mean			**0.443391**

Source: Field Survey,2016

Constraints to youth participation in food crops production

The constraints to participation in food crops production is shown on Table 6. The results revealed that majority 81.13% of the respondents were constrained by inadequate capital. Insufficient capital compounded by poor access to credit has been a major limiting factor in various agricultural production activities.

This is followed by poor government attention on agricultural sector (71.60%), poor roads and rural infrastructure (55.66%) and inadequacy of inputs at the right time accounted for 53.77%. The grand mean for the constrain to participation was 0.44 and any mean value equal to or greater than the grand mean is a significant constraints to participation. The findings agreed with [25] who found out poor infrastructure as having a serious cost implications on production as well as sales of produce from the farm gate usually located in the rural areas far from standard markets.

CONCLUSIONS

Based on the findings of the study, it is concluded that there was moderate level of participation of youth in food crops production in the study area that were mostly male.

Marital status, educational level, farm size and income were the main determinants of youth participation in food crops production. Inadequate capital and poor government attention were the major constraints to youth participation in food crops production.

Government should design adequate policies and legislation for improved funding, easier access to productive resources targeted at the youth to encourage more interest and participation in food crops production. Stakeholders in print and electronic media should provide more sensitization programmes to promote and stimulate positive view on farming.

Youths should form viable cooperatives for easy access to farm credit facilities that would improve and enhance their productive abilities.

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