Volume 19, Issue 2/2019 **PRINT ISSN 2284-7995**

E-ISSN 2285-3952

SCIENTIFIC PAPERS

SERIES "MANAGEMENT, ECONOMIC ENGINEERING IN AGRICULTURE AND RURAL DEVELOPMENT"

Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development"
PRINT ISSN 2284-7995, E-ISSN 2285-3952

Volume 19, Issue 2/2019

To be cited: Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development", Volume 19, Issue 2/2019.

Publishers:
University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania. Address: 59 Marasti Blvd., District 1, 011464 Bucharest, Romania, Phone: + 40213182564, Fax: +40213182888**,** www.managusamv.ro
Ceres Publishing House, Address: 29 Oastei Street, District 1, Bucharest, 013701, Phone/Fax: +40213179023, Email: edituraceres@yahoo.com

This volume includes the scientific papers presented at the International Conference **"Agriculture for Life, Life for Agriculture",** June 6-8, 2019, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, Section 7: Management and Economics of Rural Areas, Topics: Production economics, Farm management and agromarketing, Agricultural policies, Agribusiness and agricultural extension, Agritourism and Rural development, Environmental economics, Educational management in agronomic education, Trade in agricultural products, Insurance and reinsurance in agriculture, Food legislation, Food industry equipment and installations, Rural Statistics.

Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development"
Volume 19, Issue 2/2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

C O N T E N T

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ORGANIC FARMING: FROM DEFINITIONS AND CONCEPTS TO THE AGRICULTURAL BUSINESS AND EVEN POLITICS

Indira Deniz ALIM[1], Aurel LUP[2]

[1]„Ovidius" University of Constanta, Romania, 124 Mamaia Boulevard, Constanta City, Romania, Phone: 0040-41614576, E-mail: alimindira@yahoo.com
[2]Academy of Romanian Scientists, 54 Splaiul Independenței, District 5, Bucharest, Romania, E-mail: lupaurel@yahoo.com

Corresponding author: lupaurel@yahoo.com

Abstract

This article tackles the issue of organic agriculture/farming in all its aspects, from origins to definitions, principles and characteristics, spatial development and world and national level. The older ecological movement is considered a precursor of organic farming that appeared as an agricultural system accompanied by the necessary regulations only in the last decades of the twentieth century. Opportunities are established in response to the anthropic aggression of any nature over the quality of the environment with direct influence on people's health. The world consumer is ready to pay in this way for his/her health and life expectancy. In turn, the chronically sub-paid agricultural producer/farmer, with his work and efforts, sees organic farming as an opportunity to increase his income. Supported by the media, especially the press, organic farming is becoming more or less successful and an object of political choice.

Key words**:** *organic agriculture/farming, definitions, historical background, politics, principles*

INTRODUCTION

Organic agriculture/farming, until recently a niche version, tends to become if not dominant, at least competitive. The historical circumstances ("quickly ahead") that have led to this phase are as numerous as difficult to explain; by simplifying it to the extreme, we could say that at least two historical circumstances largely explain this evolution. They come from two directions - the consumer is increasingly unhappy with what is given to him as food, starting from vegetables that have not seen the soil, with cheese that did not see the milk with chickens infused with the syringe in relation to which the soy salami could be considered a real delicacy. The consumer is concerned not only with quality (lack of taste, appearance) but also with the fact that the intensive, productive agriculture uses a lot of toxic substances that endanger his health. On the other hand, the farmer perceiving the "demand" is increasing the "offer" of ecological/organic products, taking care to raise the price, the additional costs and to earn more as the market economy is prone to maximizing the profit.

This material shows the evolution of organic agriculture in time and space with a focus on Romania's case.

MATERIALS AND METHODS

The materials used are partly bibliographical but also based on our own research, with special reference to Romania and especially Dobrogea/Dobrudja, the geographic area where the authorities are operating. Some of the bibliographic sources come from the International Colloquium "Biological agriculture and its perspectives", which took place between November the 30th and December the 1st, 1989 in Belgium under the high patronage of the Ministry of Agriculture and Forestry of Belgium. As far as the research method is concerned, this is specific to the techniques of economic research: collection and selection of the material, processing, comparisons, synthesis, conclusions and proposals, if any.

RESULTS AND DISCUSSIONS

Origins and definitions

Philosopher R. Steiner is considered the precursor of biological agriculture. In 1924, he laid the foundation for biodynamics by proposing an agriculture adaptable to the requirements of living organisms and integrating only four main components of the biosphere: soil, plant, animal and man. In his turn, A. Howard predicts a traditional farming system with high labour input and cheap technology.

In 1975 the Japanese Fukuoka suggested a non-mechanical farming system, without fertilizers and phyto-pharmaceuticals. Similar farming systems have been developed in England and France. Also in France, the "Nature and Progress" Association, with concerns in the fields of ecology, agriculture, food, and organic farming, opposes agricultural productivity and its consequences. Among the new definitions, we refer to that provided in the EU "Codex Alimentarius", according to which the organic farm is a plant and animal production management system that promotes the use of preference practices based on internal resources. According to EU Regulation no. 2092/1991 and its subsequent amendments, the notions of biological (France, Italy, Portugal, Greece, the Netherlands), ecological (Germany, Spain, Denmark, Romania), organic (England) farming are used interchangeably.

Regarding the origin of organic farming, it seems that this is much older and its location could be even in the Mountains of Orastia in Romania where our ancestors, the Dacians built their capital city Sarmizegetusa not on high lands hard to reach and to conquer, but in a sort of glade 1,200 m height, where the bio-productivity of the meadows ensured their survival in times of restraint [9].

Principles (characteristics) of organic (biological) agriculture

At the risk of being either dogmatic or incomplete due to numerous schools of biological agriculture, it is admitted that it defines a form of management based on the permanent restoration of organic soil, allowing the maintenance of the biosphere balance due to a specific cultural technique [2, 7].

Hence, two objectives:

- pollution reduction by excluding the use of pesticides and soluble fertilizers;
- fertility heritage preservation and even enrichment by enriching the soil with organic matter.

Regarding the two objectives, the biological farming techniques in plants production are: fertilization, soil works, crop rotation, crop maintenance, disease and pest control. For each of these techniques, the author offers the list of products obtained on the farm or outside it, as well as rules to follow or use. [2]

In connection with the control and certification of biological agricultural products, A. Roig considers that this control is necessary across all links of the inter sectorial chain of which the most important are:

- Producers of fertilizers and pesticides;
- Farmers who obtain primary agricultural and animal products;
- processing industry;
- the distribution network.

The same author [13] identifies two systems:

(i)The preferential system according to which all interested enterprises from fertilizer manufacturers, farmers, to transporters, distributors are members of a single professional organization.

(ii)The interdependent system whereby the members of a professional organization can supply themselves and deliver upstream, through companies adhering to one or more member enterprises of one or more member enterprises or of one or more professional organizations.

Organic farming as separate technology

Recently, the conditions from country to country both in terms of the technological development and exploitation structures, technological systems or even agricultural systems have diversified a lot. We mainly distinguish:

- the precision agriculture characteristic to the countries with developed agriculture, but also to a growing portion of Romania,

represented by the big national and transnational commercial firms;
- rational agriculture that seeks to have the least impact on the environment, without affecting the economic efficiency;
- traditional conservative peasant agriculture with a minimum of industrial inputs, characteristic to the still very large subsistence farms in Romania;
- integrated agriculture that particularly aims at improving fertility of soils combined with technological diversification;
-imprecisely defined multifunctional agriculture, considered as a perspective one;
- biological farming (organic or ecological) based on an agricultural system that exploits natural resources so as to rebuild the soil, which uses rational agricultural techniques, multiannual cropping, the reduction and elimination of chemicals harmful to humans and animals [16].

Evolution in time and space of organic farming.

Due to certain advantages such as the positive impact on the environment as a whole positive trend of demand for organic products on the one hand and also the often confirmed hope for a better gain for the agricultural producer *converted* to the ecological system have resulted in the rapid expansion of organic farming worldwide and in Europe as well as in Romania. In our country year 2017 was registered 8,434 ecologic operators and ecologic agriculture was practiced on 258,471 hectares [10].

It also benefited from the existence of extensive spaces in which pollutants for ecological agriculture such as chemical fertilizers or insect fungicides of synthesis were applied in small quantities, thus making the conversion to it easier. This is the case for Australia, and in Europe, Romania is one of these cases. On a global level, the areas cultivated in the organic system were more than 17 million ha in more than 120 countries. In the Far East, the largest areas are found in Australia and New Zealand, followed by South America with about 568 million ha, in North America around 1.5 mil ha, in Asia 736 mil / ha, in Africa over 435 m ha, in Europe 6.3 million ha of which only in Italy over 1 million ha [4].

In Romania, before 1990, there was no talk about organic farming. However, the environmental concerns were at least theoretically present in the scientific world. Researchers at the Central Institute of Biology, the Association of Scientists, affiliated or not to the Ecology Commission carried out numerous studies on ecology issues.

For example, at the 4th Ecology Conference in Piatra Neamt in 1989, of the nearly 250 presentations distributed in 6 panels, over 90% had ecological problems as topics. A. Lup participated in this Conference with a presentation related to the irrigation of crops with saline waste water from the seaside spa establishments. The wide range of the ecological movement is proven by the XXXII volumes of Piatra Neamt conferences [6].

In Romania, in 2013 the area occupied by organic crops increased from 17438 ha to 754,000 ha, i.e. over 43 times [6].

Many areas are in the Danube Delta, which has the advantage of enjoying a biosphere reserve status with restrictions as regards the use of synthetic chemicals. It is worth mentioning that in Constanta County, in 1990, based on Law 36/1990 was founded one of the first associations that has ecologically produced since 2000 not only foodstuff but also medicinal plants. An exhibition of Stepa Farm from Stupina village, Constanta county, was visited by Gheorghe Flutur, the Minister of Agriculture at that regarding the economic efficiency of organic products, an interesting and convincing study was conducted by the Research Institute for Agrarian Economy and Rural Development of the Academy of Agricultural and Forestry Sciences, in which a comparison is made between a number of 12 vegetable products cultivated in a conventional and ecological system [8].

Fig.1. Minister of agriculture's visit
Source: Archive of Stepa farm.

Stepa's Exhibition

Based on the findings of the study, we note that:

- in an organic system, more manual labor and fewer inputs are used, some expensive ones being available in small quantities on the market or even absent.
- production per area unit is lower but is compensated by higher sales prices than those of the conventional products. However, it seems that the profitability of organic products is largely ensured by subsidies, not like in the case of conventional products [15].

Organic farming and the media

Before 1990, environmentalists only acted in scientific meetings, while after 1990, it was the turn of the press in which not only journalists like Buica, Dragusanu or Papadiuc [3, 5, 12] but also personalities such as: N. Stefan the first minister of agriculture after the conversion of Romania to the market economy or the eminent professor O. Parpala (a believer in communism) were alongside the new ecological agriculture that would catch up soon [12, 14].

Organic agriculture and politics

In Romania, like in other countries, the ecological movement so justifiable as a reaction to a polluted world in all sorts could not escape politics. It has to do with a lot of votes – "Let's found a party". On this issue, the newspaper "Coditianul" of August the 9th, 2002 published on a double A3 page a Multimedia analysis [1].

It seems, however, that as the volume of speech is growing, the deterioration of the environment is advancing (at the same pace).

CONCLUSIONS

The history of organic farming is as old as the methods by which the expanding human species has used the resources of the environment for a long time to secure its *land for food* and later on for the sake of getting rich. The organic farming recommended by enlightened minds could ensure the sustainability of the environment and of the human species. Regulatory efforts to preserve and to exploit natural resources rationally need to be appreciated. Given that more than half of the world's population is undernourished and underutilized, the extra work effort required by organic farming would not be a problem, but the gaps exist, i.e. the gaps between West and East, North and South. We also ask ourselves the question: Does globalization save ecology? This could be done if it were to be translated into deeds.

REFERENCES

[1]Analiza: ecologie, ecologism, protecția mediului – concepte europene, dar mai puțin românești, (Analysis: Ecology, Ecologism, Environment protection - European concepts, but less Romanian), 2002, Cotidianul Newspaper, București 9.08.2002.

[2]Antoine, D., 1989, Les principles de l'agriculture biologique. Col. L'agriculture biologique, Belgique,1989, pp.3.

[3]Buica, N., 1990, Agricultura ecologică (Organic agriculture) In: Satul Romanesc Magazine, București, 20.03.1990.

[4]Dobay, K., M., 2005, Managementul ecofermelor si marketingul produselor ecologice (Organic farm management and organic products marketing), Terra Nostra, Publishing House, Iași, pp.29

[5]Drăgușanu, C., 1990, Ecologia și modernizarea satului românesc (Ecology and modernization of the Romanian Village), Satul Românesc Magazine, Bucuresti, 15.02.1990.

[6]Godeanu, S., 1989, A IV-a Conferință de Ecologie (The 4th Conference of Ecology), Iași

[7]Kruzslicika, M., Chiritescu, V., 2013, Agricultura ecologică –istoric, principii și standarde europene (Organic agriculture- history, principles and European Standards), In: Oliman, P.I., Toderoiu, F., Sima, E., Determinanți economici, sociali și instituționali ai performanțelor și securității alimentare (Economic, social amd institutional determinants of food performance and security). The Romanian Academy Publishing House, București, pp.370-374

[8]Lup, A., Alexe, N., 2010. Sistem tehnologic de agricultură ecologică cu specii vegetale în cultura pură sau asociată (Technological system of organic agriculture with vegetal species in pure or associated crop). Annals of the Academy of the Romanian

Scientists, Series on Science and Tehcnology of Information, Vol. X, AOSR Publishing House, Bucureşti
[9]Marusca, T., 2017, Elemente de gradientică şi ecologie montană (Items of mountain gradientic amd ecology) Transilvania University Publishing House, Braşov, pp.110.
[10]Ministry of Agriculture and Rural Development, MADR, 2017, Agricultură ecologică (Organic agriculture), http://www.madr.ro/agricultura-ecologica.html, Accessed March 2, 2019.
[11]Papadiuc, A., 1990, Când şi cum rambursăm creditele solului (When and how could we reimburse the soil credits), Adevărul Newspaper, 3.03.1990, Bucureşti.
[12]Parpala, O., 1993, Agricultura ecologică integrată (Oragnic integrated agriculture), Tribuna economică Magazine, No.21, 22, 23/1993, Bucureşti.
[13]Roig, A., 1989, Controle de la filiere inter profesionelle. Col. L'agriculture biologique Belgique.1989, pp.2
[14]Stefan, N., 1999, În lumea satului câştigă teren produsele organice (In the village world, the organic products are developing), Agricultura României Magazine, No.32 (448) 6-12.08.1999, Bucureşti.
[15]Ursu, A., 2017, Cercetări privind eficienţa economică a sistemelor de producţie convenţional şi ecologică în contextul aplicării măsurilor de politică agricolă în România (Research regarding the efficiency of the conventional and organic production systems in the context of the application of the measures of agricultural policy in Romania), In: Alexandri, C. *et al*., 2017, Agro-food economy and rural development in a regional perspective. The Romanian Academy Publishing House, Bucureşti, pp.22
[16]Zahiu, L., 2005, Politici şi pieţe agricole-reformă şi integrare europeană (Agricultural policies and markets-reform and European integration). Ceres Publishing House, Bucureşti, pp.131.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

RESOURCE USE EFFICIENCY OF ORGANIC WHEAT PRODUCTION IN TURKEY

Esma ASLAK, Gokhan UZEL, Serkan GURLUK

University of Uludag, Faculty of Agriculture, Department of Agriculture Economics, 16059, Nilufer, Bursa, Turkey, Phone: +902242941407, Fax:+902242941402, Mobile:+905325966620, E-mail:serkan.gurluk@gmail.com

Corresponding author: serkan.gurluk@gmail.com

Abstract

Intensive cropping techniques, over-mechanized agricultural production, inefficient agricultural chemical use have negatively affected world valuable cropland, which is very important to the mankind. About 38% of Earth's land cover is occupied by agriculture. If unsustainable agricultural methods are pursued, they contribute to inefficient resource use. Organic farming is a good alternative in order to provide sustainability and efficient resource use. Yet, its production is not robust enough to play a significant role in feeding the world. Globally, 1.9 billion adults are overweight and, of those, 600 million are obese, while 793 million people are undernourished. Organic agriculture is discussed if it is the most appropriate option for sustainable agriculture. The current paper seeks to find organic wheat production and its positive impacts to the Turkish economy. In Turkey, there is no organic wheat production yet. We revealed the economic benefits when organic wheat production is partially preferred by examining the resource use efficiency. In other words, the nature of organic farming and conventional farming, what those methods demand from nature and restore to the environment, and their unit economic values constitute the subject of this study.

Key words**:** *economic efficiency, organic wheat, Turkey*

INTRODUCTION

The many issues related to agriculture, food, nutrition and human health bring complicated questions and discussions to the world agenda. Some of these discussions include matters such as the pressures on human resources, sustainable natural resource management and sustainable agriculture. Therefore, each unit of land allocated to any sector and, each unit of production input to be employed has become important nowadays. Sustainable agriculture is the focus of all these discussions. Such an agricultural system is a suitable model for both developing and developed countries dominated by industrial agriculture because sustainable agriculture is a concept that takes into account methods of sustainable land use and processing. The consumption of natural resources and the level of use of non-nature-friendly production inputs concern policy-makers and social planners. The consumption of natural resources and / or environmental pollution are topics that directly and indirectly affect the costs of agricultural production in the national economy. For this reason, a large number of studies are conducted which examine the situations in which the environment is involved in production inputs. Numerous investigations are of interest not only to developed countries but also to less developed countries. Indeed, the cost of environmental disasters (yield losses, product damage, etc.) is reflected in the cost to government and is shared by all households. However, household income distribution is not equal. Therefore, the cost of environmental problems imposes more significant costs to low-income individuals.

The current paper examines organic wheat production and its positive impacts to the Turkish economy. At present, there is no organic wheat production in Turkey. The paper seeks to find the optimal cultivated land requirement which should be allocated to organic wheat production. It contributes to the available literature by measuring the environmental and social effects by using the

proxy values of regular wheat production in the country.

MTERIALS AND METHODS

In this study, it is accepted that the farmers of the country maximize their revenues with their production decisions. They make their decisions in a single production direction. However, the externalities created by the conventional agricultural system have not been internalized yet. This model tells us the allocation requirement of a certain part of the land of the country to organic production due to sustainable agriculture. In fact, social planner thinks that a mixture agriculture system including conventional / organic production will ensure sustainable agriculture, and wonder which part of the organic farming system should be allocated. If the agro-environmental performances of the products produced by conventional agriculture from field to table can be taken into account, the internalization of the externality will be through the transition to the organic farming system. One study suggests that the monetary value paid to organic agricultural products in a country is the value of the externality created by conventional agriculture in that country [3]. The science of economics offers ideas for understanding the conditions of sustainable agriculture. The optimal of the marginal benefits. Such investigations reveal how land should be used in the most efficient way. In fact, inefficient land allocations may cause losses in general welfare.

The social opportunity cost of converting land to organic agriculture is equal to the difference between the marketable conventional product value and the externality of this production system to the environment. In other words:

$$B^o - [B^c - B^e] > 0 \qquad (1)$$

must be realized by the sustainable agricultural system. In the equation, B^o indicates the benefits of the organic farming system, B^c indicates the benefits of the conventional agricultural system and B^e is the negative environmental externalities of the conventional agricultural system.

We consider Hartwick's optimal land use paper in this study in order to understand optimality conditions of the wheat production [2]. Although Hartwick's work is related to forestry / agricultural conversion, it can also be applied to this study. The discounted marginal rent value of the organic field (MB^o), will be converted until the discounted value of the remaining conventional / organic area is equal to the discounted future marginal rent value (MB^l). If the marginal utility of sustainable agriculture is (MB^l), the environmental externality of conventional agriculture is (MC_j^{ce}) and (MB_m^o) is considered to be the marginal benefit of the area to be left to organic agriculture following equality follows the Hartwick rule:

$$MB_j^l = MB_j^c - MC_j^{ce} = MB_m^o \qquad (2)$$

In short, the current model, with its current agricultural land of a country, attempts to maximize the economic values of the conventional and organic wheat agricultural system for period *t* inside investigated time period *T*. If we formulate what is described;

$$V = \int_{t=0}^{T} W_0(t)e^{-rt}dt + W_c(T)e^{-rT} \qquad (3)$$

W_0 : Economic and social benefit flow of organic wheat farming
W_c : Economic and social benefit flow of conventional wheat farming
r: Discount rate

Eqyation 3 is assumed to be $dW_0/dt > 0$ because the soil that purified of agricultural chemicals and inorganic fertilization will increase its efficiency over the years. Part of the increase in the benefit is due to the increase in the price that will be generated by the additional demand for such goods by the adoption of the organic agriculture movement. It will also contribute to the value of social welfare by protecting natural resources and public health effects. If we say $\bar{f}$ to total cultivated wheat field and f is the amount of land allocated to conventional wheat production, we can formulize the net present

value of the social benefits of sustainable agriculture as follows:

$$NPV(T,f) = (\bar{f} - f)\int_{t=1}^{T} W_0(t,f)e^{-rt}dt + f\int_{t=1}^{T} W_c(t,f)e^{-rt}dt \quad (4)$$

Equation 4 is maximized by deriving the first-order conditions for country-level, and re-arrange:

$$B^c + fB_f^c = B^o - (\bar{f} - f)B_f^o \quad (5)$$

The benefit function of conventional wheat production is under the effect of health expenditures caused by pesticides, production value loss caused by decreasing pollination (risk premium) and the cost of the treatment of water pollution caused by agricultural chemicals and greenhouse gas (CO_2 or its equivalent) emission arising from agricultural production. They are considered in calculating the values of USD/year. Therefore annual benefits and annual cultivated areas are helpful to estimate per hectare values of the conventional wheat production. These three components has been linked to the conventional wheat production amount as a damage cost that has been imposed to the society. Thus, the data set belonging to 1980-2016 has been considered as panel data.

Health problems caused by pesticide use is very important and must be considered. At this study, impacts of pesticides' on humans are considered although it has impacts on other species as well. However the economics of health is a troublesome process because it is closely related with keeping and accessing data. In developed countries such as UK many studies has been performed about this issue, but data sharing and studies in this issue are limited developing countries [5] [6]. We used benefit transfer method by taking account other researches' results. Following general formula was used to do this:

$$I_j = (Y_i / Y_j)^E * I_i \quad (6)$$

I_j: Impact value for country j
Y_i: Income in country i
Y_j: Income in country j
E: Income elasticity of demand for environmental benefits
I_i: Impact value for country I

We transformed the calculated value to cultivated areas in related year in Turkey, the inquiring value is 0.0957 USD/Ha.

In this study pesticide use has been monetized as a "damage risk". In pollination damage value calculation, need for insect pollination coefficients are used [1]. In the related study agricultural products that need pollination has been classified and 0.1, 0.5 and 0.9 coefficients were determined ranked from the products that have minimum pollination need to the products that need maximum amount of pollination. The pollination dependency coefficients has been used as 0.1 for vegetables and 0.5 for fruits for Turkey. Following formula we produced was used to calculate pesticide damage risk in Turkey, and was found 176.8 USD/Ha:

$$(\sum_{i=1}^{n}(V_{vi} * P_{vc_i} + V_{fi} * P_{fc_i}))/ (wheat\ harvested\ area_i/total\ ag.area_i) \quad (7)$$

where V_{vi} is vegetable production value and P_{vc_i} is pollination dependency coefficients of vegetables. Likewise, V_{fi} is fruits production value and P_{fc_i} is pollination dependency coefficients of fruits. Annual biological purification cost of water in Turkey was declared, in a report, by Ministry of Environment and Urbanization as 0.1412 USD/Tones. By using this data, pesticides purification cost was calculated with following formula:

*Gross water purification costs = Average annual per capita water consumption (Tonnes/person)/Year * Total population (Persons) * Purification costs of water in Turkey (USD/Tonnes)* (8)

The data in the above formula has been compiled by using different reports published by Turkey's "State Water Hydraulics". Gross water purification cost was estimated as 2,257,788,000 USD/Year with an average per capita water consumption of 205 m^3/Year, total population and purification costs of water in Turkey of 0.1412 USD / Tons. Pesticide active ingredients value was employed to calculate the amount of cost

allocated to conventional wheat production. This value is 0.47 kg / Hectare in Turkey [4]. Thus, water purification cost charged to conventional wheat production is estimated as 519,291,240 USD/year by using following formula:

WPC= (Pesticides active ingredients*cultivated wheat area / Turkey's cultivated area) X (Gross water purification costs (9)

where: the WPC is water purification cost charged to conventional wheat production which is calculated as 45.35 USD/Ha in Turkey.

Finally, we consider greenhouse gas (CO_2) emission arising from agricultural production externality. We used the amount of CO_2 emission (or equivalent) needed to produce 1 ton of wheat and the cost of disposal of this emission for necessary for calculations.

Therefore cultivated annual conventional wheat production value minus its externalities mentioned above were considered in the statistical analysis in order to find the optimal land amount. Organic wheat production's externality was only arising CO_2 emission. In this study, farm gate prices has been used to calculate the yearly wheat production value. It has been assumed that 50% yield loss will occur when production transitions to organic wheat and the organic wheat price will be 20% more than the conventional wheat. And the value of the CO_2 emission reduction has been determined by using the data from the carbon market. According to this, the disposal cost of 1 kg CO_2 is considered to be 0.02 USD [7].

RESULTS AND DISCUSSIONS

Ordinary Least Squares estimator was used to estimate the model parameters related to equation 5.

Model coefficients have statistical significance. Model parameters are accepted to robust when examined the R^2 values (Table 1).

Optimality condition in equation 5 is satisfied at 18.13 point. It is stated that conventional wheat production area must be %18.13 of current cultivated area in Turkey.

Table 1. Numerical model results of two models

	B	Std. Errors	Significancy
Constant_organic	-80,888.96*	8,292.29	0.000
ln_land_organic	44,101.73*	2,209.64	0.000
R^2 for model organic	*0.803*		
St_Er_of_org_mod_est.	*20,403.87*		
Constant_conventional	-1,462,011.70*	193,515	0.000
ln_land_conventional	635,882.19*	51,565.87	0.000
R^2 for model conventional	*0.608*		
St_Er_of_conv_mod_est.	*478,159.89*		

**Statistical significancy at %1 level*
Source: Authors' own estimation.

Conventional wheat production amount in Turkey is approximately 7.6 million hectare annually. However, the model suggests to be 1.3 million hectares. If we take into account the annual negative externality of wheat production which is 227.5 USD/Ha and the total annual external cost would be 1,416,061,536 USD annually.

The results numerically demonstrate the importance of organic farming. Wheat is still an important nutrient for Turkey, and is the leader in Europe with 150 kg of bread consumption per capita. In addition, the importance of sustainability in wheat production is obvious when considering a significant portion of the per capita income is allocated to food expenditure. Although the productivity of organic wheat production is low, scientific studies should be focused on how to increase the efficiency in this field and sufficient budget should be allocated such studies. The fact that the portion of Turkish agricultural land allocated for wheat production to be reduced to 18% is not theoretically possible, it can be said that it is the target to be reached.

CONCLUSIONS

In this study, the optimal production area of conventional and organic wheat production in Turkey is calculated. In determination of the optimality conditions, the effect of healthcare expenditures caused by pesticides, production value loss caused by decreasing pollination (risk premium) and the cost of the treatment for water pollution caused by agricultural chemicals and for greenhouse gas (CO_2 or its

equivalent) emissions arising from agricultural production. The optimal area of land for conventional wheat production is that which makes the marginal benefit of this production equal to the marginal benefit of organic wheat production. According to the results, the conventional wheat production area should be reduced by to 18.13 % of the current production area for conventional wheat production in Turkey.

The model only addresses the optimal conditions with available data. If additional data on externality is obtained, a more extensive model can be developed. In a further study, drought and climate change conditions may be included in the model and their externality effects can then be analyzed. In order to reduce the negative externalities of wheat production in Turkey, prevention of food wastes, reduction of post-harvest losses, guaranteeing the use of certified seed, along with the re-design of many policies and creation of new ones such as a restriction on the use of agricultural chemicals must be realized. There is no doubt that the implementation cost of all these policies will be less than 1,416,061,536 USD/year.

REFERENCES

[1] Carreck, N., Williams, I., 1998, Economic value of bees in the UK. Bee World 79: 115-123.

[2]Hartwick, J. M., 1992, Deforestation and National Accounting." Environmental and Resource Economics 2:513-521.

[3]IFOAM, 2011, Resource efficiency and organic farming: facing up to the challenge. IFOAM EU Group Belgium.

[4]Ozbek, F, Ş., Fidan, H., 2014, Use of agricultural chemicals in wheat production: Case of Konya Province. Kahramanmaras Sutcu Imam University Journal of Natural Science 17: 13-17.

[5]Pimental, D., H. Acquay, M. Biltonen, P. Rice, Silva, M., 1992, Environmental and economic cost of pesticide use. BioScience 42: 750–759.

[6]Repetto, R, Baliga, S. S., 1996, Pesticides and the immune system: the public health risks. Executive summary. Central European Journal of Public Health. 1996 Dec; 4(4):263-5.

[7]Türe, C., 2011, Carbon Market. Solar Academy Internet Page: http://www.solar-academy.com/menuis/Karbon-Borsasi-Cengiz-Ture.011800.pdf. Accessed in July 8, 2018.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

TRENDS IN CONCENTRATION OF BULGARIAN AGRICULTURE

Rositsa BELUHOVA-UZUNOVA

Agricultural University – Plovdiv, 12 Mendeleev Blvd, Plovdiv, Bulgaria, Phone: +35932654382, Email: rosicab_uzunova@abv.bg

***Corresponding author*:** rosicab_uzunova@abv.bg

Abstract

The integration to the EU led to serious changes in Bulgarian agriculture. The implementation of Common agricultural policy caused significant transformations in farm structures. There are substantial variations in the number and the size of the agricultural holdings. The aim of the study is to highlight the main trends in the level and dynamics of concentration in Bulgarian agricultural sector. The Lorenz curve, as the most widely used measure of inequality, is applied in the paper to analyse the process of concentration and the distribution of agricultural holdings. The results indicate that the large structures continue to grow, while small farms are disappearing. The survey shows insubstantial role of medium-sized holdings, polarization and dualistic structure of Bulgarian agriculture.

***Key words*:** *direct payments, structural changes, polarization*

INTRODUCTION

The EU enlargement caused serious transformation in the structure of agricultural holdings across Europe. The process of concentration in the EU Member states provokes debate among researchers, farmers and policy makers. The trends in the distribution of agricultural holdings are highlighted by number of studies [13, 14, and 17]. Piet et al. [12] observe the role of several drivers of farm-size inequality in France. Loughrey et al. [8] investigate the distribution of agricultural land in Western Europe by focusing on spatial clusters. The OECD published report on the subject for a set of 14 countries - two in Asia (Korea, Japan), two in America (Canada, the USA), and ten EU Member states [3]. According to the Transnational Institute [19] there are severe challenges related to the term "land grabbing" in the EU: "Europe is currently experiencing tremendous and rapid land concentration. This process is adversely affecting the lives and livelihoods of millions of small-scale farmers and agricultural workers"[19].

Therefore the overconcentration raises concerns about the future of European agriculture. In Bulgaria this process is changing the rural areas significantly, and is causing a number of social, economic and ecological challenges.

After the accession to the EU there is substantial variation in Bulgarian agricultural structure. The number of holding is declining and the average farm size is increasing. Although there are some positive trends and changes, the agricultural sector is characterized by unbalanced distribution of the holdings and domination of the large farms.

The aim of the study is to highlight the main trends in the level and the dynamics of concentration in Bulgarian agricultural sector and to formulate recommendation for balanced and sustainable development.

The study is structured as follows: First section presents the materials and methods of the study. Second, the dynamics and different dimensions of concentration are observed. The survey focuses on the comparison with EU average. In the third section some important conclusions and recommendations are outlined.

MATERIALS AND METHODS

The main purpose of the study is to examine changes and trends in concentration and distribution of farms by UAA and Standard Output between 2003 and 2016. The results

could be starting point for a discussion about future of CAP after 2020.

The data is collected by Eurostat Database (Farm Structure Survey 2003, 2010, 2016) and Ministry of agriculture, food and forestry in Bulgaria.

The changes in economic size and concentration are conducted by using the Eurostat classification of farms. "By economic size (based on standard output in EUR), agricultural holdings form nine groups" [4].

In the paper is applied Lorenz curve as a main indicator for inequality [20]. The curve presents income distributions as proposed by Lorenz [9]. After Krugman [7] Lorenz curve and Gini coefficient have become a widely used method for measuring geographic concentration. The Lorenz curve and the Gini coefficient are applied in number of studies for observing concentration of agricultural structures [10, 14, and 18].

This approach is conceptually similar to the method "by quantiles" [2]. Functional relation proposed by Rasche *et al*. [15] is used in the survey to estimate Lorenz curves. The explicit functional form is shown in the equation 1:

$$L(F; q) = [1 - (1 - F(q))^{\alpha}]^{1/\beta} \quad (1)$$

$$0<\alpha\leq 1,\ 0<\beta\leq 1$$

L (F; q) is the cumulative distribution of the operated hectares or standard output and F (q) is cumulative distribution of number of holdings. The function possesses the proper convexity and slope constraints to assure that it always lies in the lower triangle of the unit square [15].

In the study, the Lorenz curve is constructed based on two indicators – utilized agricultural area and standard output. The main purpose is broader analysis of the level of concentration and the changes in farm structures.

RESULTS AND DISCUSSIONS

The study focuses on the changes in terms of physical and economic size of Bulgarian farms after accession to the EU. The survey aims to answer the question whether the CAP implementation stimulates Bulgarian agriculture in resolving some issues, which have occurred during the transition period.

According to EUROSTAT [5] in 2016 the UAA is over 17 million hectares and there are more than 10.3 million farms in the EU.

In Bulgaria the UAA and the number of holdings are only 2% of all area and all farms in the EU (Table 1). In 2016, the results from Farm structure survey conclude that nearly 33% of all EU farms are in Romania and 14% - in Poland [5].

Table 1. Farm holding and utilized agricultural area, 2016

Country	Number of holdings		Utilized agricultural area (UAA)		Small farms (under 5 ha)		Large farms (> 50 ha)	
	in thousands	share of EU total (%)	in 1,000 ha	share of EU total (%)	share of all farms (%)	share of UAA (%)	share of all farms (%)	chare of UAA(%)
EU-28	10,321.2	100.0	171,288.5	100.0	65.4	6.1.	7.0	68.1
Bulgaria	202.7	2.0	4,468.5	2.0	82.6	2.9.	4.8.	87.3

Source: Farm structure Survey 2016.

More than 65% of all farms in the EU 28 are small. On the other hand 68% of UAA is concentrated in 7% of farms (farm size more than 50 hectares). Large farms are dominating structures in Luxembourg (52%) and France (41%).

The distribution of holdings is most uneven in Romania. Around 92% of the farms are under 5 ha while less than 1% of all structures is more than 50 ha, concentrating approximately 50% of the total UAA.

In Bulgaria the level of concentration is higher than EU average. Nearly 88% of all UAA is in large structures, although they represent less than 5% of all holdings. Small farms (under 5 ha) accumulate only 2% of agricultural area.

The results indicate that there is dualistic structure of Bulgarian agriculture, which raises concerns about the opportunities for balanced development in the sector. The implementation of the CAP caused overconcentration and substantial changes in specialization patterns. The country becomes producer of extensive crops and exporter of raw materials and primary products. By contrast, the production of extensive crops and livestock are declining [1].

Figure 1 represents the evolution in Bulgarian farm structure for the period 2003-2016. In Bulgaria the transition period is associated with substantial transformations in agriculture. The political and the economic instability during the 90s caused serious problems with land fragmentation and a decrease of agricultural production. The pre-accession period is characterized by a decrease in the number of the farms and their consolidation. After the accession to the EU, the implementation of the CAP has caused further changes in farm structures. For the past 30 years there are serious variations and restructuring in the sector.

For the period 2003-2016 there is downward trend in the number of farms, and the rate of decline in the country is more than 70%. These changes are typical for the almost all Member states in the EU. In the 2003-2013, the number of farms has declined by half, not only in Bulgaria, but also in Slovakia and Italy.

In 2016 in Bulgaria are registered 200 thousand agricultural holdings [11]. Compared to their number in 2013 and 2010, the decrease is with respectively 21% and 46%.

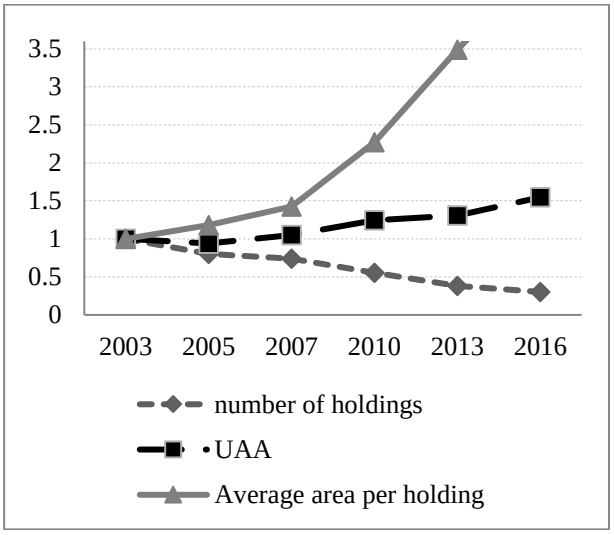


Fig. 1. Changes in Bulgarian agricultural structure (2003=1)
Source: Own calculation based on Ministry of agriculture, food and forestry.

For the period 2003 – 2016 in Bulgaria is observed the highest increase in the UAA, although the country accounts for only 2% of the total UAA in the EU-28. In 2016 France and Spain are the two Member States with the largest UAA, with respectively 16% and 13.2%, followed by United Kingdom (10%) and Germany (9%).

The trends across the Member-States are similar. While more than 25% of the farms disappeared between 2003 and 2016, the total utilized agriculture area remains stable. Therefor the average area per holding increases from 11.7 hectares in 2003 to 16.59 hectares in 2016 [5]. In 2016, in the Czech Republic is observed the highest average farm size (130 ha), followed by the United Kingdom (90 ha). The average farm size is below 10 hectares in Malta (1.2 ha), Cyprus (3.2 ha) and Romania (3.7 ha). In Bulgaria, however is registered major growth in the average farm size. In the beginning of the analyzed period the average size of the holdings is 4.4 hectares. In 2016 the average size rises nearly 5 times to more than 20 ha.

The results show some positive trends – the average farm size and the utilized agricultural area are increasing. On the other hand, wider and broader analysis of Bulgarian farm structure observes some alarming processes.

Figure 2 presents the distribution of agricultural holding by economic size for the period 2003-2016.

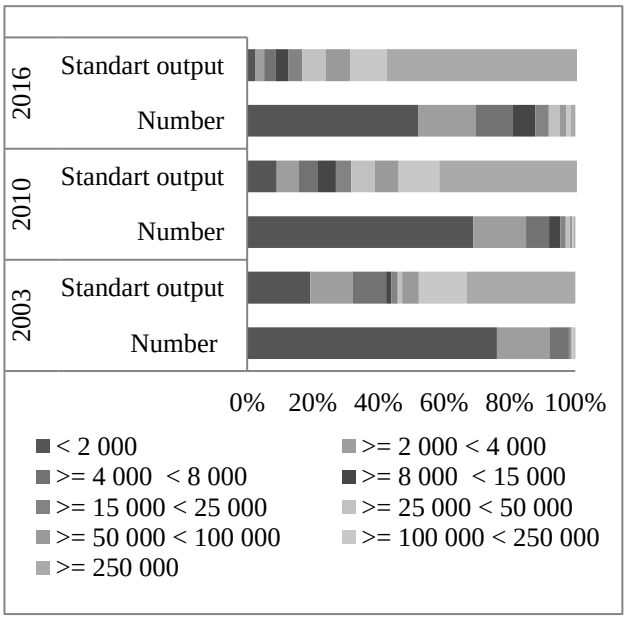


Fig. 2. Distribution of holdings by economic size
Source: Own calculation based on Farm Structure survey.

The data analyze the share of farms in number of holdings and produced standard output in Bulgaria.

For the analyzed period the share of small farms (below 2,000 EUR) in the number of holdings and in the standard output is declining respectively with 23% and 17%. On the other hand, the share of large farms (over 250,000 EUR) in the number of holdings is increasing gradually (1.2%). However, there is a significant growth in their share in the standard output (more than 25% of the total standard output in the country).

The results outline other major issue concerning Bulgarian agriculture - the insufficient role of medium-sized farms. The share of the holdings between 8,000 EUR and 50,000 EUR is around 13% and they account for only 15% of the standard output. Despite the accession to the EU, the polarization of Bulgarian agriculture is broadening and the country could not form balanced agricultural structure.

For the period 2003-2016 the dynamics in the level of concentration is observed by Lorenz curve. The abovementioned indicator corresponds to the objectives of the analysis and characteristics of agricultural sector. Lorenz curves are a graphical presentation of inequality [9]. This approach allows visual impression of farms structure distribution in Bulgaria.

Figure 3 shows the changes in Lorenz curves based on the physical size.

In Bulgaria the level of concentration and the inequality distribution are increasing. In 2003 the share of holdings under 0.5 ha is 62% and they accumulate only 3% of the UAA. By contrast, less than 1% of farms is over 100 ha but poses 78% of the UAA. In 2010 disproportions are increasing. The share of small structures is more than 60%, but they account for only 1% of the UAA. On the other hand the large holdings over 100 ha (2.3% of all farms) are handling 84% of the area. In 2016 the over-concentration is furtherly broadening.

The results based on the Lorenz curve are in parallel with the trends observed by the analysis of economic size of holdings. The farm structure is characterized by concentration of UAA in the large holdings, insignificant role of the small ones and the reduction of their share in the total number of farms.

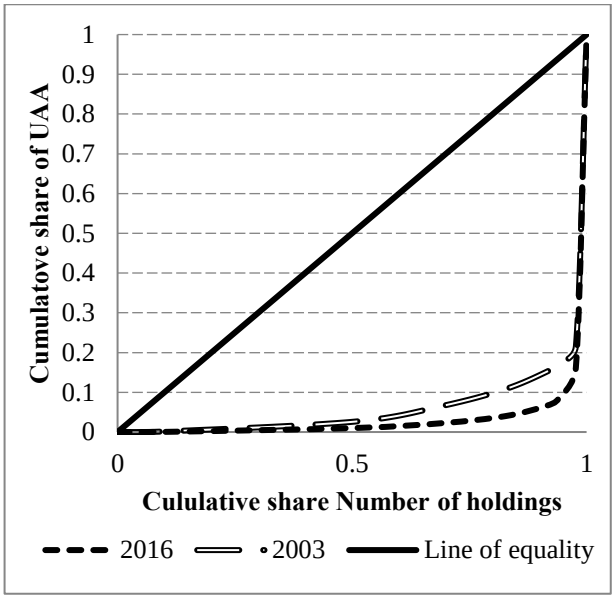


Fig. 3. Lorenz curve based on UAA
Source: Own calculation based on Ministry of agriculture, food and forestry.

After the accession to the EU, the group of small farms is declining. The reduction however is not related to the increase of their size but is due to the suspension of their activities. On the other hand, the dominance of large farms increases and process in these structures does not correspond to changes in other classes of farms.

The Lorentz curve, compared to the line of equality, shows an increase in concentration and inequality in terms of number of farms and their economic size (Figure 4).

In 2003 76% of all holdings are very small (economic size under 2000 EUR) and account for more than 20% of the standard output. In 2010 these farms are approximately 68% but provide only 9% standard output. By contrast, in 2003 the farms with the largest economic size (over 250,000 EUR) are only 0.2% of the total number, but account for 35% of the standard output. In 2010, there is an increase in the share of large structures and they are 1% of all farms. These holdings produce more than 54% of the standard output. In 2016, the share of large farms is growing and they are 1.4% of all holdings. The same trends are

observed in their share in standard output (58%). On the other hand, the farms with economic size under 2,000 EUR provide less than 4% of the SO.

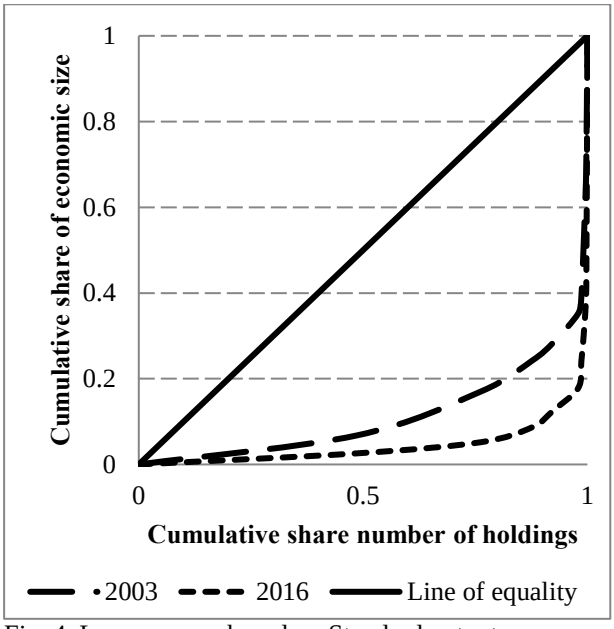


Fig. 4. Lorenz curve based on Standard output
Source: Own calculation based on Ministry of agriculture, food and forestry.

These results indicate that there is concentration of standard output in the large structures. By contrast, the significance of small farms is declining as they provide only insubstantial share of the standard output. Another important conclusion is related to the medium-sized farms. Although their share increases, these farms still play insufficient role in Bulgarian agriculture.

The analysis indicates for a dualistic structure of holdings in Bulgaria. The data shows that small farms are diminishing, and so is their importance and economic size. Different trends are registered for large structures. They improved their performance and dominate in Bulgarian agricultural structure.

There are differences between the two types of Lorenz curves - calculated on the basis of economic size and based on the UAA. First, the level of concentration concluded on base of the UAA is higher than the one related to the economic size. The higher values are mainly associated with the role and importance of livestock farms, which are not represented by Lorenz curve based on the UAA. Therefor indicator outlines greater imbalance between small and large structures. Secondly, with the expansion of UAA, the land is absorbed more intensively, which also reflects the Lorenz curve. Despite the indicated differences in both types of curves, similar trends and variations in the structure of agricultural holdings have appeared.

The analysis of farm distributions by physical and economic size show that the transformations could not lead to the expected results. Although there are some positive changes, many unsolved problems still are challenging the sector.

The main reasons for the transformations are associated with the implementation of the CAP and the financial support in form of direct payments. There is a serious imbalance in financial aid distribution [6]. Substantial subsidies are provided to large structures, while small farms could not receive funds because they do not meet the EU criteria or there is an insignificant financial support. „The change in development policies both at national and international level requires new approaches to be used in rural areas“ [16].

The uneven financial support distribution influenced the processes of specialization and concentration of Bulgarian agriculture. The dominance of extensive farming and the problems in the livestock and in the intensive crops changed the production structure and export list of the country. Bulgaria become major exporter of wheat and sunflower seed, while the importance of the high value added products in is decreasing. The abovementioned trends are reflecting the opportunities for sustainable development of Bulgarian agriculture and cause serious imbalances.

CONCLUSIONS

Based on the analysis, some conclusions and recommendations could be highlighted:

After the accession to the EU, the changes and the dynamic in the process of concentration demonstrate that there is an irrational dualistic structure in the country. Despite the increase in the average farm size, the polarization of agricultural holdings remains.

There is a strong differentiation in crop production, both at sectoral and regional level. Although the intensive sectors are always characterized by a higher UAA than the intensive ones, the role of vegetables, fruits and vineyards is reducing substantially comparing to cereals and oilseeds.

Despite the significant increase in the level of concentration, livestock farms are small and fragmented. These trends hamper the development of rational concentration and optimal size.

The variations of concentration, analyzed by the Lorenz curve indicate major disproportions in Bulgarian agriculture.

Lorenz curve show the main features of Bulgaria agriculture – imbalanced farm structure - too many small farms with insignificant economic size and a small number of large structures that provide a much larger share of standard output.

In the new programming period, the CAP needs serious revision – the main priorities of the Pillar 1 should be related to greater support of small and medium-sized farms.

The CAP after 2020 should include new redistributive land policies, reduction of direct payments and better targeting. The EU funds should be directed to family farms in order to stop and reverse the processes of overconcentration.

Some of the schemes represented and designed in the 2014-2020 programming period (for example Young Farmer scheme and Small farms scheme) are showing insufficient results not only in Bulgaria. They are not efficient enough and could not provide support to majority of Bulgarian farmers.

The CAP should continue to change and evolve. Despite the considerable support of the CAP, EU agriculture is unviable and dependent on poorly targeted direct payments.

The national agricultural policy in Bulgaria should direct the financial support to traditional sectors with high value added and stimulate the development of family farming.

ACKNOWLEDGEMENTS

This survey is part of the Project 05-18 “Impact of the agricultural structural changes on rural development in Bulgaria”, financed by the Centre of Research, Technology transfer and protection of intellectual property rights at the Agricultural University-Plovdiv.

REFERENCES

[1]Atanasov, D., Popova, B., 2010, Sustainable development characteristics of different dairy farms in Bulgaria, Trakia Journal of Science, Volume 8, Suplement 1, p.245.

[2]Beluhova-Uzunova, R., Atanasov, D., Hristov, K, 2017, Analysis of direct payments distribution in Bulgarian Agriculture, Trakia Journal of Sciences, Vol. 15, Suppl. 1, pp 282-287.

[3]Bokusheva, R., Kimura, S, 2016, Cross-country comparison of farm size distribution. OECD Food, Agriculture and Fisheries Papers 94, OECD Publishing, Paris (France).

[4]Eurostat, 2015, Farm structure survey 2013 - main results, Data extracted in November 2015, https://ec.europa.eu/eurostat/statistics-explained/index.php/Farm_structure_survey_2013_-_main_results, Accessed on 18/03/2019.

[5]Eurostat, 2018, Farm structure survey 2016, Press release, 105/2018 - 28 June 2018, https://ec.europa.eu/eurostat/documents/2995521/9028470/5-28062018-AP-EN.pdf/8d97f49b-81c0-4f87-bdde-03fe8c3b8ec2, Accessed on 18/03/2019.

[6]Hristov, K., 2011, Institutional problems small farmers face when applying for assistance under the rural development program (2007-2013), Trakia Journal of Sciences,Suppl.3, Vol.9, pp 83-87.

[7]Krugman, P., 1991, Geography and Trade, MIT Press, Cambridge.

[8]Loughrey, J., Donnellan, T., Lennon, J, 2016, The Inequality of Farmland Size in Western Europe. In 90th Annual Conference of the Agricultural Economics Society. Warwick (UK).

[9]Lorenz, M, 1905, Methods of measuring the concentration of wealth. Quarterly Publications of the American Statistical Association, 9, New Series, No. 70: 209-219.

[10]Merce, E., Merce, C., Dumitras, D., 2010, Characterization of the Degree of concentration in agriculture using the Gini coefficient, Bulletin UASVM Cluj Napoca, Horticulture, 67(2), p.150-154.

[11]Ministry of Agriculture, Food and Forestry, Agrostatistics, Farm Structure Survey for 2003, 2007, 2010, 2013, 2016.

[12]Piet, L., Latruffe, L., Le Mouël, C., Desjeux, Y, 2012, How do agricultural policies influence farm size inequality? The example of France. European Review of Agricultural Economics 39: 5–28.

[13]Piet, L, 2016, Recent trends in the distribution of farm sizes in the EU, 149th EAAE Seminar ‘Structural change in agri-food chains: new relations between farm sector, food industry and retail sector’ Rennes, France, October 27-28, 2016.

[14]Popescu, A., Alecu, I.N., Dinu, T.A., Stoian, E., Condei, R., Ciocan, H., 2016, Farm structure and land concentration in Romania and European Union`s agriculture, Agriculture and Agricultural Science Procedia, 10 (2016): 566 – 577.
[15]Rasche, R., Gaffney, J., Koo, A.Y., Obest, N., 1980, Functional forms for estimating the Lorenz curve. Econometrica 48(4):1061–1062.
[16]Shishkova, M, 2017, Social Network Analysis of the Organizations Implementing Leader Approach in Bulgaria, Bulgarian Journal of Agricultural Economics and Management, Vol. 62, Issue 3, pp. 35-39.
[17]Toma, E., Vlad, I, 2018, Land concentration changes in Romania during 2002-2016 period, Agro Life Scientific Journal. Volume 7, Number 1, 137-142.
[18]Todaro, M, 2003, Economic Development. (8th Ed.). Toronto: Addison-Wesley.
[19]Transnational Institute, 2013, Land concentration, Land grabbing and people's struggles in Europe, Final Report. Published by the Transnational Institute (TNI) for European Coordination via Campesina and Hands off the Land network, Amsterdam, Netherlands. https://www.tni.org/files/download/land_in_europe-jun2013.pdf, Accessed on 18/03/2019.
[20]Ultsch, A., J. Lötsch, 2017, A data science based standardized Gini index as a Lorenz dominance preserving measure of the inequality of distributions. PloS one. 12(8), https://www.ncbi.nlm.nih.gov/pubmed/28796778, Accessed on 18/03/2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE NECESSARY OF LABOR FORCE IN THE TWO CONVENTIONAL AND ECOLOGICAL AGRICULTURAL SYSTEMS

Alexandra-Marina BRĂTULESCU (MANOLACHE)[1], Ionuț-Laurențiu PETRE[2], Liviu MĂRCUȚĂ[1], Alina Gabriela MĂRCUȚĂ[1]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania, Emails: bratulescu.alexandra@iceadr.ro, liviumarcuta@yahoo.com, alinamarcuta@yahoo.com
[2] Research Institute for the Economy of Agriculture and Rural Development, 61 Marasti Blvd, District 1, 011464, Bucharest, Romania, Mobile: +40769314045, Email: petre.ionut@iceadr.ro

Corresponding author: bratulescu.alexandra@iceadr.ro

Abstract

In this paper, it is desired to establish the differences regarding the agricultural labor force needs for two different systems, namely the conventional and the ecological system. In the first part of the paper, in quantitative and qualitative terms, we will analyze data on labor force evolution in Romanian agriculture, using the data provided by the National Institute of Statistics. This first analysis supports the determination of the existing labor force in agriculture in order to determine whether this can be sufficient for both conventional and organic farming systems. In the second part of the paper, the specific labor force needs will be determined for some cereal crops analyzed in parallel in both conventional and ecological systems. With the help of the indicators in the technological sheets, it will be possible to achieve an average of labor force between crops in order to determine the specific differences between the labor needs between the two agricultural systems.

Key words**:** *evolution, Romania, labor force, conventional and ecological*

INTRODUCTION

Agriculture has become an area of interest not only for specialists involved in research activities, but also for the general public, mainly representing consumers / agricultural producers. Being an interdisciplinary field, based on mutual influences in the field of agriculture and environmental protection, the terminology used has new meanings, resulting in the emergence of a specific language [2].
Of the population employed by economic activity, it is confirmed that the balance of the labor force includes persons through whom incomes are generated in the economic or social activities carried out, on the basis of legal contract.
In Europe, agriculture is the most important sector, because it is a food producer that is essential for life. Farmers producing both processed and unprocessed agricultural commodities and raw materials for the food, feed and textile industry [3].
The European Union places a special emphasis on obtaining products of plant and animal origin through organic farming methods and encourages those who practice such agriculture. Organic farming offers many advantages: a higher percentage of employment, although the labor force needs in organic farming are higher compared to the conventional system; in economic terms, organic farming ensures profit, even if the harvest records losses [4]. Financial and economic crisis effects have come forward by a reduction of workplaces and unassailably, releasing labour into unemployment, by restricting and slowing down the processes of creating new workplaces, having direct consequences locking young people's access at the labour market and labour market egress of people with assailable position [6].

MATERIALS AND METHODS

The present paper is subject to the analysis with data regarding the labor force evolution in the Romanian agriculture, but also the labor force specific needs for some grain crops analyzed in parallel in both conventional and

ecological system with the data provided by the National Institute of Statistics (INS) and the Ministry of Agriculture and Rural Development (MADR), using the quantitative and qualitative comparative analysis of data from the analyzed period 2010-2017. From the technological charts, data will be extrapolated to achieve the average labor force between crops in order to observe the distinctive differences between the need for labor and the two agricultural systems.
The specialty literature comprises a series of scientific papers which present the results obtained after the economic research carried on in the ecologic agriculture sector [5].

RESULTS AND DISCUSSIONS

In the first part of the analysis we want to evaluate both the current stage and the evolution of the labor force level in agriculture in Romania. Labor force in agriculture was analyzed through the statistical data provided, referring to the employed population in different sectors of the economy.
The figure below analyzes the labor force in agriculture, comparing it with other sectors of the national economy to find out the position of the former.

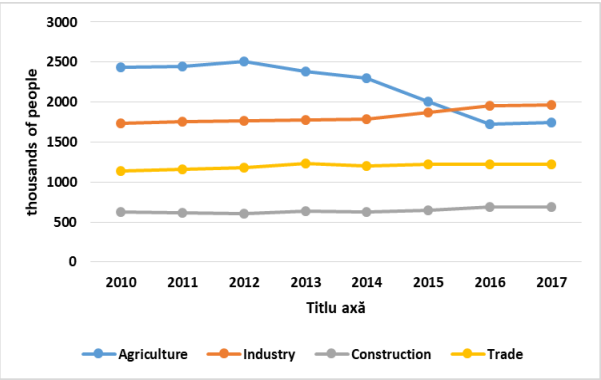


Fig. 1. Evolution of the employed population in different national economic activities.
Source: processing based on INS data

As can be seen from Figure 1, the number of persons working in agriculture was the highest among all the other activities of the national economy in the period analyzed 2010-2015, showing a decreasing trend, cumulated with the fact that the number of working persons in the industry registered increases , the latter has surpassed the branch of agriculture, so in the last two years you have analyzed the branch that registered the largest number of workers was the industry, a positive fact for the economic development of the country, considering the average structure of the European Union.
The other two branches were construction and trade, they registered a slight trend of growth, but well below the level of the first two branches of the national economy.

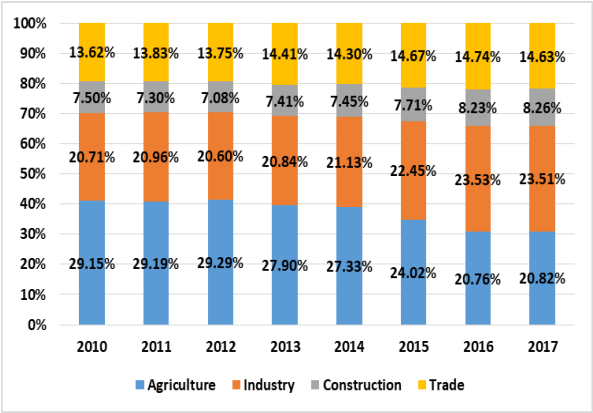


Fig. 2. Determining the labor force weight for the main economic branches Source: processing based on INS data

Of the employed population in agriculture, it can be noticed that its share in the total labor force decreases in the analyzed period 2010-2017, from 29% to 21%, due to the fact that the number of people working in this field recorded an average annual negative rate , of -4.7%, and the average of the agricultural labor force was 26%. In industry, on average, about 21.7% of the employed population is employed, but in the last two years the share has increased significantly, becoming the branch with the largest number of jobs, namely 23.5% of the total, annual growth rate of 1.8%.
Trade accounts for about 14% of all jobs on average, a slight upward trend, with an average growth rate of 1%.
Regarding the construction sector, it is observed that it offers the fewest jobs among the 4 branches analyzed, but it holds a fairly significant weight, on average, of 7.6%, with annual increases of 1.44%.

The following aspects can be observed regarding the number of persons working in agriculture and their status by analyzing at once the structure of the labor force as well as of the employed population in this field.

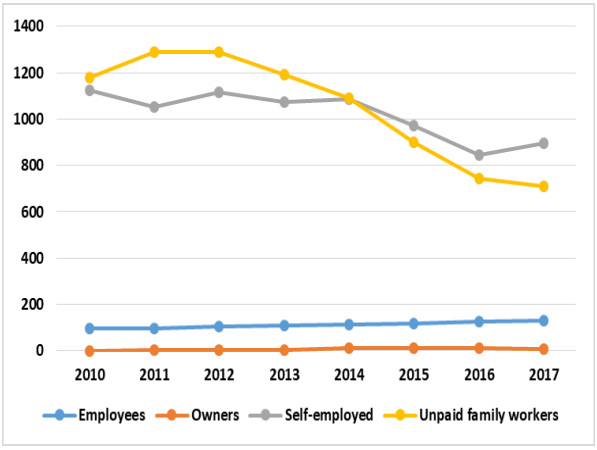


Fig. 3. Determining the structure of the labor force in agriculture, and its evolution
Source: processing based on INS data.

As can be seen from Figure 3, most of those working in agriculture are self-employed or unpaid family workers. There is a relatively small number of employees, compared to the other categories, and a smaller number of employers. In 2010-2014, of the four categories, the workforce for the family was the most numerous, but they declined in the following period, with an average annual rate of -7%. In the second part, in the first part of the analyzed period, the workers were registered on their own, but they became the most in the last period (about 900 thousand persons). Of the other two categories, we can recall that on average there were 114 thousand employees and 7 thousand employers, both of which registered increasing trends, with an average annual rate of 4% and 33%, respectively. Analyzing the share of each professional status in the agricultural sector, between 2010 and 2017, two categories can be seen in the Figure 4.

Figure 4 shows that people working in agriculture are divided into non-family workers, with an average share of 47.85% over the entire analyzed period, and the other main category being self-employed, with an average share of 46.51%.

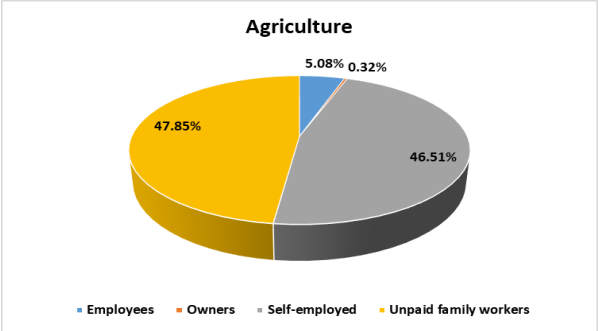


Fig. 4. Structure of employed population in agriculture during 2010-2017
Source: processing based on INS data.

Of the total number of people working in agriculture, only 5.08% were employed during the reference period, and only 0.32% were employers. Analyzing in comparison the persons working in agriculture according to the professional status with the professional status at national level, for all economic branches can be seen the differences in Figure 5.

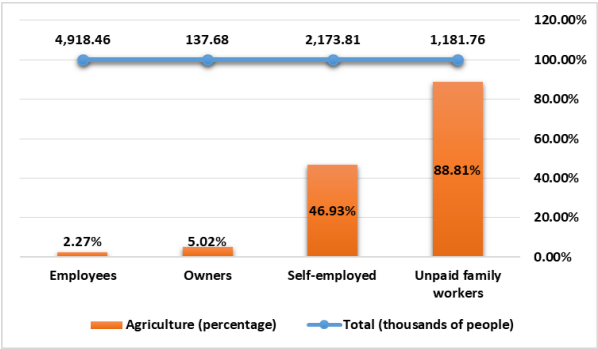


Fig. 5. Share of the employed population in agriculture from the total in the period 2010-2017 according to the professional status
Source: processing based on INS data [8].

Figure 5 proposes the comparative analysis of the number of persons working in agriculture, in relation to the total number, according to the professional status, of the 1.18 million people working for the family, not remunerated, about half and 89% are found in agriculture. Self-employed in the agricultural field account for 47%, out of a total of 2.17 million, and in the category of those holding agricultural activities, respectively employers occupy 5%, while in the same field of activity, only 2.3% represent the employees of the total labor force available on the market.

Analyzing the differences in labor force between conventional and organic agriculture,

it was proposed to analyze the labor consumption indicator for the first three crops in the crop production structure (field crops) in terms of production value, namely maize, wheat and sunflower. Achieving an average of time consumption for both production systems, we notice the following difference.

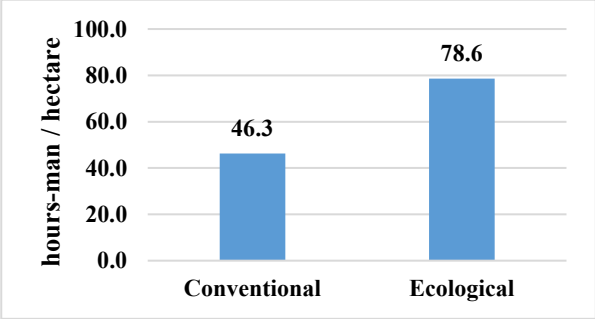


Fig. 6. Average skill gap between conventional and organic farming
Source: data processing based on Ursu et al. (2017), [12].

CONCLUSIONS

Agriculture is one of the basic branches of the economy in our country, able to bring a substantial contribution to the revival of the economic growth [1].As a result of the statistical analysis of the Romanian households, it is noted that the largest part of the expenses of households is assigned to consumption. "The size and structure of these expenses are directly influenced by the level of incomes. There are other factors that differentiate the level and structure of consumption expenses, the effects of which are cumulated at the level of households according to different features "[7].
If the reduction of the labor force was not a social problem, from an economic point of view, the shift from conventional farming to organic farming would not negatively influence the activity of the farm with regard to labor costs [10]. The necessity of training and improving the labor force in agriculture derives from the fact that the practice of some professions in the agricultural field (vegetable, animal breeding, etc.) presupposes the scientific knowledge of the physical, chemical, biological processes, etc, on which plant and animal production depends [9].

REFERENCES

[1]Berevoianu, R., Necula, D., Teodorescu, E., Dumitru, E., Burnichi, F., Veverca, D., 2015, Agricultura conventionala si ecologica in legumicultura, floricultura si cultura plantelor medicinale, Editura ASE (Conventional and organic agriculture in vegetable culture, flower culture and medicinal plants culture, AES Publishing House), p 137
[2]Bruma, I.S., Tanasa, L., (n.d) Termeni şi noţiuni de agricultură ecologică, (Terms and notions of organic agriculture), Accessed from researchgate.net, Accessed on 12.04.2019.
[3]Copa-Cogeca European Farmers and Agri-Cooperatives, 2011, Le role de l'Agriculture Biologique dansl'Agriculture Europeene, www.copaq-cogeca.eu, Accessed on 15.04.2019
[4]Dinu, M., Soare, R., 2015, Noţiuni Teoretice si Practice de Legumicultură Ecologică, Editura ASE (Theoretical and practical notions of vegetable culture, AES Publishing House), p 512
[5]Gruia, R., 1998, Managementul eco-fermelor - bazele conceptuale şi metodologice, Editura Ceres (Eco-farms management- basic concepts and methodology. Ceres Publishing House), pp. 2-4
[6]Mărcuță, A., Mărcuță L., Tindeche, C., Angelescu, C., Niculae, I., 2014, The influence of economic crisis on the labour in the European Union's member states, Scientific Papers: Management, Economic Engineering in Agriculture & Rural Development, Vol. 14(1):201-206.
[7]Marza, B., Marcuta, L., Marcuta, A., 2015, Statistical Analysis of the Indicators that have Influenced the Standard of Living in Romania During the Economic Crisis, Procedia Economics and Finance, Vol. 27, pp. 587-593.
[9]National Institute of Statistics, www.insse.ro, Accessed on 16.04.2019
[10]Palicica, M., 2005, Resursele umane şi pregătirea forţei de muncă din mediul rural, Editura Orizonturi Universitare, Timişoara, (Human resources and labor training in the rural space, University Horizons Publishing House), pp. 239.
[11]Petre, I. L., 2018, Comparative Labor Force Analysis in Conventional and Ecological Agriculture – Oleaginous Plants, Agrarian Economy and Rural Development Realities and Perspectives for Romania International Symposium The 9 Edition, Research Institute For Agriculture Economy And Rural Development.
[12]Ursu, A., Surca, E., Petre, I., 2017, Indicatori ai eficientei economice pentru agricultura conventionala si ecologica, Editura ASE, (Indicators of economic efficiency for conventional and organic agriculture, AES Publishing House), pp. 25, 39, 46.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

STUDY REGARDING THE EGG'S CONSUMPTION AND THE PERCEPTION REGARDING THE EGG'S QUALITY

Mirela CĂRĂTUȘ STANCIU

"Lucian Blaga" University of Sibiu, Faculty of Agricultural Sciences, Food Industry and Environmental Protection, 5-7 Ion Ratiu Street, 550003, Sibiu, Romania, Phone: +40269211338, Fax:+40213182888, Mobile:+40744472790, Email: mirela_stanciu2008@yahoo.com

Corresponding author: mirela_stanciu2008@yahoo.com

Abstract

The paper is based on the study of various reports and different type of articles regarding the EU egg's production and egg's quality. In order to determine the Romanian consumers' perception regarding the quality of the egg, a questionnaire was prepared which was completed during January-February 2019 by 124 people from Sibiu County. Egg purchase preferences show that 42% of people prefer eggs bought from peasants, 29% of people buy from the shop next to the house, while 29% of people buy eggs from the supermarket. The main motivation to consume eggs is for 58% of respondents the rapidity of preparation. More than 50% of people appreciate the eggs as tasty and only 29% see a source of protein of animal origin in egg consumption. Buyers are pretty well informed about the link between the coded egg and the hen's breeding system (54%). Sensory characteristics and nutritional value of foods are the factors on the basis of which consumers appreciate the quality of the eggs.

Key words**:** *egg, quality, consumption, market, poultry*

INTRODUCTION

The external quality of eggs is appreciated based on texture, colour, shape, health and hygiene of the shell. The egg shell must be integral, smooth, clean and free from cracks. They all must be homogeneous in colour, shape and size.

Market eggs must comply with these strict standards so that only high-quality products reach the consumer.

Consumers appreciate the quality of the egg in terms of the colour of the yolk and its colour variation in a batch of eggs. The colour of it is therefore an important criteria for appreciating the value of the egg.

Specialty literature states that in surveys conducted in different countries on egg samples of different colours, the interviewees showed pronounced interest to the most intense yolk colours. [17, 18]

The colour of the yolk on a hen's egg yolks is determined in particular by the content and type of carotenoids present in the food. As such, the level of carotenoids in it should be adjusted to match the colour preference of the consumers. Consumer perception about the colour of yolk depends on the geographical area and traditions. They especially prefer egg with a more intense coloured yolk [9].

In order to produce the best possible quality eggs for buyers, we need to consider the yolk colour measurement, which is made using the (DSM YolkFan) colour standard, which is widely accepted in the food chain as the standard for measuring the colour of yolk.

The main sources of xanthophyll pigment are known: red corn, maize gluten and Lucerne. Carotenoid pigments can also be extracted from many other sources such as lobsters, daffodils, marigolds, fruits (pineapple, citrus fruits, pepper, insect, flamingo, canary), marine animals (crustaceans, salmon) and yeasts (*Phaffia rhodozyma*). [1, 4, 7, 10, 12, 13, 16] These pigments offer a wide range of different colours from light yellow to dark red. [8] Lutein from the xanthophyll pigment gives a yellowish colour while zeaxanthin from the xanthophyll pigment gives a yellow golden colour.

The yellow colour of the egg yolk can be induced by incorporating into the food ingredients such as corn, maize gluten, Lucerne and by adding natural or synthetic pigments or a combination of these types into it.

Different factors can affect the consumption of eggs: cultural or regional values, customer preferences, religious beliefs, etc. [14].
The countries which are leading when talking about the consumption of eggs per inhabitant are: Japan, Paraguay, China, Mexico, Ukraine, Malaysia, Brunei, Slovakia, Belarus and The Russian Federation [2].
The average egg consumption per inhabitant reached approximatively 9 kg in 2013 according to Faostat [6].

MATERIALS AND METHODS

The paper is based on the study of various reports and different type of articles regarding the EU egg's production and egg's quality.
In order to determine the Romanian consumers' perception regarding the quality of the egg, a questionnaire was prepared which was completed during January-February 2019 by 124 people from Sibiu County.
The questionnaire was administered by a single interviewer and included demographic data on the respondents: gender, age, domicile, level of training and occupation of the respondents, number of family members, etc.
The goal was to know the traits consumers are looking for when buying eggs (frequency of consumption, place of purchase, average monthly consumption of eggs per person, importance of sensory aspects to appreciate the freshness of eggs, etc.).
The questionnaire was structured into 14 items: the frequency of egg consumption; monthly average family consumption of eggs; place of purchase; the table at which the eggs are consumed; the main motivation of egg consumption; knowledge of the nutritional value of the egg and of the link between the number recorded on the egg and the poultry rearing system; the aspects that influence the purchasing decision; egg size and yolk colour preferences; perception of the relationship between the colour of the yolk and the quality of the egg; perception of the relationship between the colour of the shell and the poultry breeding system; the motivation underlying the purchasing decision from local producers.

RESULTS AND DISCUSSIONS

Countries like China, U.S., India and Mexico are the leaders in egg market. The share of laying hens by housing system show that at the world level more than 90 % of hens are living in cages, 8 % in barns and only 2 % in free range systems [19].
On EU level, the share of systems for keeping laying hens is 55.6% in chicken coops, 25.7% in barns, 14.1% in free range, and 4.6% in bio systems [18].
The hen house of the U.E. was 390.7 million heads in 2016 and 526.5 million heads respectively in 2017 [5, 15].
The five countries with the largest number of hens in each housing system on the EU-28 level, in 2016, was: enriched cages (Spain, Poland, France, Italy, United Kingdom), barn systems (Germany, Netherlands, Italy, Sweden, Austria), free range (United Kingdom, Germany, France, Netherlands, Spain), organic (Germany, France, Netherlands, Italy, Sweden) [19].
According to the methods of production, the number of laying hens in 2017 by way of keeping was 53.2% enriched cages, 26.5% barns, 15.3% free range and 5.1% in organic systems. The data shows that in alternative systems there was a total of 186,064,310 laying hens (46.8%). The egg prices on the EU-28 level in 2017 was 128.06 EUR/100 kg [5].
According to the number of laying hens exploited in 2017, the countries with the largest flocks in the EU were: Germany (52.65 million heads), France (49.04 million heads), Spain (46.73 milion heads), Poland (46.26 million heads), Great Britain (44.13 million heads) Italy (34.96 million heads), the Netherlands (34.32 million heads), Belgium (9.41 million heads), Portugal (9.22 million heads), Sweden (8.06 million heads).
These top 10 countries with the largest flocks of laying hens in the EU-28, exploited approximatly 84.2% of herds of the member countries in 2017 (Fig. 1).
From the total of 7,528 (in 1,000 tonnes) egg production in 2017, the EU-28 main eggs producers (in 1,000 tonnes) were: France (13%), Germany (12%), Italy (11%), Spain

(10%), United Kingdom (10%), Netherlands (9%), Poland (8%).
In 2018 and 2019 the EU-28 countries ramain the main exporters of eggs on world level.
In 2018 the EU-28 Member States exported eggs to Japan; Switzerland, Israel, Thailand, Taiwan, Mauritania, South Korea.
The European Consumer Association (BEUC) has indicated some characteristics that consumers are looking for in eggs. In recent years, there has been little research into consumer perceptions of egg quality. In Romania, such studies are even less conducted.

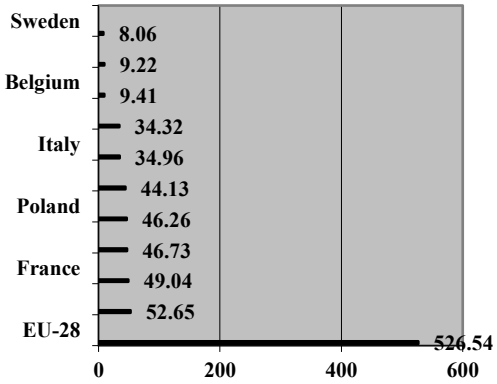


Fig. 1. The number of laying hens in the main EU countries in 2017 (million).

However, the data from consumer surveys conducted in recent years has brought us a lot of knowledge in this area.
In 2001, in Spain, such a study was conducted among 3,085 people. The purpose was to confirm the appreciation of the eggs according to the BEUC characteristics. The results of the survey showed that for consumers the most important attributes given to eggs are "safety", "freshness", "nutritional value" and "sensory characteristics".
With regard to ”sensory characteristics”, the results of surveys over the last 10 years in several European countries like France, Germany, Italy, the United Kingdom, Spain, Poland and Greece show that consumers appreciate a number of tangible characteristics of the egg. „Sensory characteristics” refer mainly to the resistance of the shell, the consistency of the white and the color of the yolk.
The visual evaluation of the egg provides quick information and links with the sensory perception of egg quality through the color of yolk.

The perception of Romanian consumers about the quality of the eggs. Case study Sibiu county

At the end of 2017, Romania with a flock of laying hens of 7.98 million heads, held the 11th position in the EU-28, while in 2016, with 8.2 million heads, occupied the 7th position [5, 15].
The questionnaire was structured in demographic data on respondents and 14 items. The questionnaire was completed by 124 people. The demographic data of the respondents are shown in Table 1.
Respondents' data show that 63% are women, and 37% are men.
Approx. 50% of people are 20 to 40 years old, 25% are between 41 and 60 years, 8% are over 60 years old, while only 17% are less than 20 years old. A share of 46% of those interviewed are high school graduates, 12% have graduated from a vocational school, 38% have higher education and 4% have only secondary education.
The family size of the interviewed is 4 in the case of 42% of the respondents, 2 in the other 33% and 25% have families of more than 4 people.

Table 1. The demographic data of the respondents

Gender (n=124 persons)		**Age (n=124 persons)**				**Level of education (n=124 persons)**				**The family size (n=124 persons)**		
Male	Female	Less than 20 years old	20 to 40 years old	Between 41 and 60 years old	Over 60 years old	secondary education	vocational school	high school	higher education	2 persons	4 persons	More than 4 persons
46	78	21	62	31	10	5	15	57	47	41	52	31

Source: Own designed based on [16].

Weekly consumption of eggs per person is for 50% of the people questioned 2-3 times a week, which means that the egg is a favorite food in the family of those investigated.

Also, approx. 21% of people questioned consume eggs at least once a week.

Monthly family consumption of eggs is estimated at up to 10 pcs. in the case of 29% of people, between 11-20 pieces in the case of 33% of those interviewed and between 21-30 pieces for approx. 21% of respondents. Just about. 17% of people said that their family consumed more than 30 eggs a month.

Egg purchase preferences show that 42% of people prefer eggs bought from peasants, 29% of people buy from the shop next to the house, while 29% of people buy eggs from the supermarket.

We wanted to find out at what times of day the eggs are consumed. Thus, 75% of respondents said they eat egg especially at breakfast. There is also a weight of 25% of people who serve eggs at lunch, while only 8% of those questioned consume eggs for dinner.

It has been found that only 50% of interviewees know the nutritional value of an egg, being concerned about the composition of the food. The other half of people have admitted that they do not know the details about the chemical composition and nutritional value of the egg.

The main motivation to consume eggs is for 58% of respondents the rapidity of preparation. More than 50% of people appreciate the eggs as tasty and only 29% see a source of protein of animal origin in egg consumption.

Buyers are pretty well informed about the link between the coded egg and the hen's breeding system (54%). And this result entitles us to say that consumer information actions are needed.

The main issues that determine the purchase of the eggs are: shelf life (50% of respondents), shell cleanliness (33%), producer's name (29%), yolk color (29%), shell color (17%). These results lead us to assert that in the view of buyers, the purchase of the egg is based on their food safety, reflected in freshness, knowing that the egg, like other animal food, is easily perishable.

Regarding the size of the egg, the preferences of the interviewees are 58% directed towards the middle-sized eggs, while for 33% of the people this egg characteristic is less important. The rest of the respondents prefer large eggs.

Regarding the color of yolk, 62.5% of those surveyed prefer eggs with intense colorful yolks, 29%, eggs with medium coloring yolk. This result of our survey overlaps with the result obtained in a study on sensory perception of product quality in Europe (case study poultry products) conducted in 2005. Thus, between 60 and 61% of Italians, Germans and Spanih preferred eggs with more intense coloring yolk, while this type of egg was preferred by 48% of French and 33% by British. These buyers (2,122 people) prefer eggs whose yolk falls to 14 on the egg color appreciation scale. This study has shown that in the case of eggs their quality is perceived by the sensory characteristics [11].

The preferences of those questioned regarding the country of origin of the eggs show that 71% of those surveyed prefer eggs from hens exploited in Romania, their purchase decision being not significantly influenced by the price of the egg.

According to the surveyed people, the intensity of the color of the yolk is associated with the system in which the hens are exploited (42%), the belief that the egg is healthier (42%), the freshness of the egg (18%).

Interviewed people know how to distinguish between eggs from hens raised in the open air and hens raised on the ground. Thus, 42% of people know that eggs from hens grown in the open air have a different nuance of the shell, and the birds have access to different sources of food. However, approx. 21% of respondents believe that the color of the egg shell is an indicator of freshness.

The main reasons that buyers buy eggs from local producers are: confidence in the producer (29%), references from other customers (25%), belief that eggs are fresh (25%). At the same time, very few people

believe that the price of eggs from hens raised in peasant farms is low.

CONCLUSIONS

Enriched cages are the dominating housing system for laying hens in the EU-28. It is followed by barn system, free range and organics systems. The EU is the main global egg trader, because more than 50 % of all eggs form the international markets are exported or imported by EU member states.

In the next years it is expected that the egg production in the EU will grow faster than the consumption.

Weekly egg consumption of those surveyed is for 50% of people of 2-3 eggs. Families of 83% of respondents consume monthly between 10 and 30 eggs. More than half of those surveyed are accustomed to buying commercial eggs.

Consumers appreciate the quality of eggs in terms of sensory characteristics. Thus, they expect a good quality egg to have a strong, shiny, brightly colored yolk (valued at 14 on DSM Yolk Color Fan).

Sensory characteristics and nutritional value of foods are the factors on the basis of which consumers appreciate the quality of the eggs.

Weekly egg consumption of those surveyed is for 50% of people of 2-3 eggs. Families of 83% of respondents consume monthly between 10 and 30 eggs. More than half of those surveyed are accustomed to buying commercial eggs. 75% of the investigated people consume the egg at breakfast. Only 50% of respondents know the nutritional value of the egg. Buyers are pretty well informed about the link between the coded egg and the hen's breeding system. We believe that action is needed to inform the public about the composition and nutritional value of products of animal origin. The main motivation to consume eggs is for more than half of respondents the rapidity of preparation. Approximate 62.5% of those surveyed prefer eggs with intense colourful yolks. The interviewees associate the intensity of yolk colour with the system in which the birds are exploited.

Those surveyed are accustomed to buying medium-sized eggs. The preferences of those questioned to buy eggs produced in Romania show that the price is less important in making the purchasing decision. Those who buy eggs from local producers trust them and think the eggs are fresh.

The main key factors in the quality of poultry products are: food safety, hygiene and freshness.

REFERENCES

[1]Boia (condiment), Wikipedia, https://ro.wikipedia.org/wiki/Boia_(condiment), Accessed on March 5, 2019.

[2]Countries that consume the most eggs, Worldatlas.com, www.worldatlas.com./articles/countries-that-consume-the-most-eggs.html, Accessed on 10 February 2019.

[3]DSM Yolk Color Fan - Eggtester, http://www.eggtester.com/products/dsm-yolk-color-fan, Accessed on March 5, 2019.

[4]Eggs naturally enriched with Omega-3, https://www.agricola.ro/, Accessed on March 5, 2019.

[5]Eggs - Market situation, Dashboard Eggs, E.U., http://ec.europe.eu/agriculture/sites/agriculture/files/dashboards/eggs-dashboard_en.pdf, Accessed on 10 February 2019.

[6]Faostat, Food and Agriculture Data, http://www.fao.org/faostat/en/#data/QA, Accessed on 10 February 2019.

[7]Forage recipe enriched with xantophiles for laying hens,http://pub.osim.ro/publication-server/pdf-document?PN=RO131834%20RO%20131834&iDocId=9524&iepatch=.pdf, Accessed on 10 February 2019.

[8]Galobart, J., Sala, R., Rinco, X., Carruyo, N., Manzanilla, E.G., Vila, B., Gasa, J., 2004, Egg Yolk Color as Affected by Saponification of Different Natural Pigmenting Sources, https://www.researchgate.net/publication/298790324_Egg_Yolk_Color_as_Affected_by_Saponification_of_Different_Natural_Pigmenting_Sources, Accessed on March 5, 2019.

[9]Guyonnet, V., 2013, Eggs and egg products: Consumers' attitudes, perceptions and behaviours, International Egg Comission, http://ww2.kqed.org/bayareabites/wp-content/uploads/sites/24/2014/09/VincentGuyonnetEggs.pdf, Accessed on 10 February 2019.

[10]Hasin, B.M., Ferdaus, A.J.M., Islam, M.A., Uddin, M.J., Islam, M.S., 2006, Marigold and Orange Skin as Egg Yolk Color Promoting Agents), http://free-journal.umm.ac.id/files/file/Marigold%20and%20Orange%20Skin%20as%20Egg%20Yolk%20Color%20Promoting%20Agents.pdf, Accessed on Feb. 5th, 2019

[11]Hernandez, J. M., 2005, Sensory perception on quality products across Europe: a case study on poultry quality, https://www.esn-network.com/fileadmin/

inhalte/documents/Conference-ESN-Hernandez.pdf, Accessed on Feb. 5th, 2019
[12]Lokaewmanee, K., Yamauchi, K., Komori, T., Saito,K., 2011, Enhancement of egg yolk color by paprika combined with a probiotic, The Journal of Applied Poultry Research, Volume 20(1): 90–94. https://doi.org/10.3382/japr.2009-00140 , https://academic.oup.com/japr/article/20/1/90/778762, Accessed on March 5th, 2019
[13]Mavromichalis, I., 2013, How to produce Eggs with natural pigments, ht7tps://www.wattagnet.com/articles/14731-how-to-produce-eggs-with-natural-pigments, Accessed on Feb.4th, 2019.
[14]McNamara, D. J., 2015, The Fifty Year Rehabilitation of the Egg, Nutrients, 7, 8716–8722. https://kopernio.com/viewer?doi=10.3390/nu7105429&route=6, Accessed on March 5th, 2019
[15]Popescu Agatha, 2018, Aspects and trends in the European Union and Romania's egg market, Scientific papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 18(1):357-370
[16]Sava Sand, C., 2015, Arnica Montana L. as medicinal crop species, Scientific papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 15(4):303-308.
[17]Senbeta, E. K., Zeleke, N.A., Molla, Y., 2015, Attitudes and Perceptions of Consumers to Chicken Egg Attributes in Eastern Ethiopia, Journal Anim. Pro. Adv. 2015, 5(6):705-710.
[18]Windhorst, H.W., 2018, Patterns of EU egg production and trade – A 2016 status report, International Egg Commission. Special Economic Report.
[19] World egg consumption continues to rise slowly in 2017,www.poultrytrends.com/201711/index.php, Accessed on 10 February 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

COMPARATIVE ANALYSIS OF THE ACADEMIC PERFORMANCE IN THE AGRICULTURAL UNIVERSITIES FROM ROMANIA AND REPUBLIC OF MOLDOVA USING THE NONPARAMETRIC METHOD OF DATA ENVELOPMENT ANALYSIS

Ilie CERCEL[1], Gina FÎNTÎNERU[2], Elena TOMA[2], Augustin VOLCONOVICI[1], Alla CHIRSANOVA[1], Anatol RACUL[1]

[1]State Agrarian University of Moldova, 44 Mircesti Str., 2049, Chisinau, Republic of Moldova, Emails: anatol.racul@gmail.com
[2]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania, Email: elenatoma2001@yahoo.com

Corresponding author: anatol.racul@gmail.com

Abstract

The aim of the paper is to evaluate adequately the academic performance efficiency of the teaching and research staff employed in the agricultural higher education institutions and organizations in the field of agricultural science and innovation. At the same time it is developed the nonparametric method of Data Envelopment Analysis for rating assignment DEA_UASM. As a result of analyzing the academic performance rating by option variable returns to scale, it is possible to determine the resources for improving staff activity by evaluating the distance function for each causal factor.

***Key words*:** *academic performance, data envelopment analysis, higher education, research rating*

INTRODUCTION

Conducting a general, complex and specific analysis of the Human Resource Management within the organizations, including the agricultural ones, we could state that Human Resource Management deals with finding the most effective ways to improve and use staff skills, competencies and knowledge: starting with recruiting and hiring qualified people for vacant positions and continuing with directing and encouraging staff development and training as they face issues and challenges that may occur along the way of achieving the established goals. The goals of the Human Resource Management can be grouped as follows: organizational, personal and economic goals. Academic performance in the field of staff management represents the achievement of organization's goals, methodological-didactical results, stability, flexibility and adaptability to the changing environment with minimal staffing costs. The indicators that characterize the academic performance are the following: efficiency of the activity results, material efficiency of the academic process and non-material efficiency of the academic process. Social efficiency can be defined as the level of satisfying the interests and needs of the staff, namely: remuneration for work, its content, the possibility of personal self-realization, improving staff's communication and job satisfaction through team building strategies. The indicators that characterize social efficiency focus on the employment objectives and objectives related to relationships with other employees. Economic efficiency refers to the organizations operating under conditions of market economy and competition, but staff management also extends to non-commercial organizations, and respectively to central and local administrative-public organizations and state institutions that do not have as targets the maximization of profits and significant gains in competitive struggle. Employee productivity means achieving the goals of any organization with minimum resources. Staff management represents the activity of providing the organization with employees of a certain qualification and quality, their

motivation and use in achieving the goals related to the economic and social efficiency [1].

The resources of agricultural higher education institutions and organizations in the field of agricultural science and innovation include the material, financial, human and informational potential they have at a given moment:

-*Material resources* that represent the physical components of the capital of an agricultural higher education institution and organizations in the field of agricultural science and innovation, which also include study facilities, libraries, accommodation and other spaces, etc.;

-*Financial resources* that include the potential of the higher agricultural education institution and organizations in the field of agricultural science and innovation in the form of money from the state budget as well as from special means;

-*Human resources* representing the teaching, scientific and auxiliary staff, the most active and creative resources at the level of an agricultural higher education institution and organizations in the field of agricultural science and innovation;

-*Information resources* that constitute a real tool for managers to take advantage of opportunities that appear in the academic environment or to avoid situations that could endanger the scientific, teaching, research and innovation activity.

Generally, sustainable development of agriculture and rural areas in the Republic of Moldova is conditioned by a number of factors, among which, the human resources with a high level of qualification and professional training occupy, in our opinion, a priority position. Considering the present level of development and capitalization of agricultural enterprises in the rural areas of the Republic of Moldova, and the competition on a free market that forces them to confront directly with the Western partners much better positioned, both in terms of existing facilities and of the necessary human and financial resources, they are forced to act operatively to reduce these gaps. The staff employed in agricultural higher education institutions and organizations in the field of agricultural science and innovation represents the main resource of any agricultural institution, the quality and efficiency of which depend to a great extent on the results of their activity and competitiveness. Human resources are the engines that set in motion the material, financial and informational elements, develop new inventions and make innovations, develop and promote science, create new products and services, homologated varieties, and concomitantly, train young specialists who become graduates with a wide range of agricultural specialties and specializations required on the labour and educational market.

This essential component of an economy that depend on the agricultural higher education institutions and organizations in the field of agricultural science and innovation contributes significantly to the economic development and growth of a country in general and of the rural areas in particular by training and providing the necessary number of qualified specialists in various fields. It is therefore necessary to make a more comprehensive assessment of the academic performance of staff employed in higher agricultural education institutions and organizations in the field of agricultural science and innovation in order to identify whether all costs provided for research, teaching-learning and innovation activities are being used efficiently and effectively. All the more, it is necessary to identify those optimal performance standards through which agricultural higher education institutions and organizations in the field of agricultural science and innovation could make the most efficient use of the ratio of all existing resources under any form of inputs and outputs.

MATERIALS AND METHODS

Our survey included a sample of 228 students enrolled at four faculties of the University of Agricultural Sciences and Veterinary Medicine of Bucharest (USAMV) in 2017. As for the State Agrarian University of Moldova (UASM), the survey was similar to the one

carried out in Bucharest and included a sample of 324 respondents i.e. 3rd, 4th and 6th year students. In recent years, several studies have been conducted to determine performance efficiency of the academic staff employed in higher education institutions using Data Envelopment Analysis (DEA). If we emphasize the importance of implementing DEA, then we can observe that in most cases the studies are conducted on two segments, the first being at the academic performance level of the higher education institution (the strategic level), and the second segment being at the level of departments/faculties or laboratories (operational level) within these institutions. At the same time, the method of Data Envelopment Analysis has been widely applied to various industries such as healthcare, transport, and many other industries and organizations [3]. The scientific and unique novelty of our research consists in the fact that we conducted a DEA involving all three hierarchical levels of a modern organization: strategic, operational and individual level. The efficiency of the object under evaluation can be defined as the ratio of the weighted sum of outputs over the weighted sum of inputs [4].

RESULTS AND DISCUSSIONS

According to the framework regulation on the standardization of the scientific-teaching activity in the higher education system, the full time status of staff means that the employee has a didactic/scientific/scientific-didactic position, who carries out his/her basic activity in the higher education institutions and who is registered nominally in the institution's framing scheme.

It is described the comparative analysis of the academic performance of different faculties and different years of study in the Fig. 1 and Fig. 2. The best academic performance is obtained by the faculty of Biotechnologies with the 8.24 rating. As to the results obtained by the students at the different years in the Faculty of Management, Economic Engineering in Agriculture and Rural Development in the 2017 we can state that the best is the four year of the study. The scientific innovation of the paper consists in justifying the method of assessing the academic performance by using the linear programming techniques of the data envelopment analysis in the comparison of results obtained by the University of Agricultural Sciences and Veterinary Medicine of Bucharest and the State Agrarian University of Moldova. A nonparametric rating approach has been developed to evaluate the performance management in the higher education and research.

The notion of teaching staff includes several scientific, didactic and teaching positions (recently also called functions), such as: university assistant, university lecturer, senior lecturer (it disappeared as a didactic-scientific position in November 2014 with the entry into force of the Education Code), associate professor and university professor.

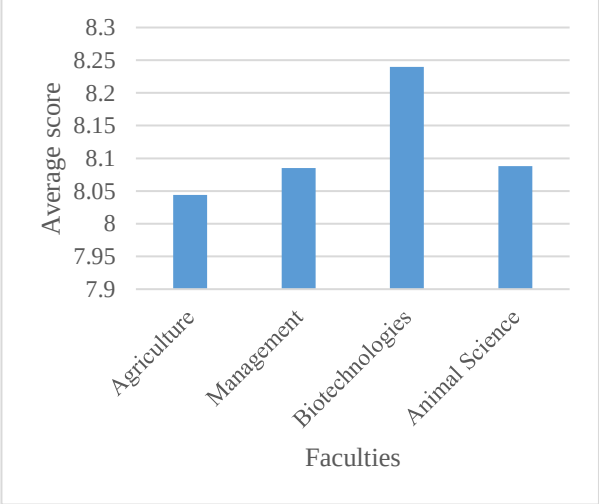


Fig. 1. The academic achievement of the students of the faculties of USAMV in the 2017 year.
Source: Own calculations based on data of the Survey.

Each successive teaching position corresponds to a higher professional level, the highest being the university professor. All these positions, except for the first one, are taken by competition every five years. Respectively, we consider it appropriate to carry out a detailed analysis of the scientific-didactic and didactic positions regarding the level of quality and professional development.

The comparative analysis of the students' academic performance in the two agricultural higher education institutions supposes to

identify the indicators able to better highlight the efficiency of the performed study.

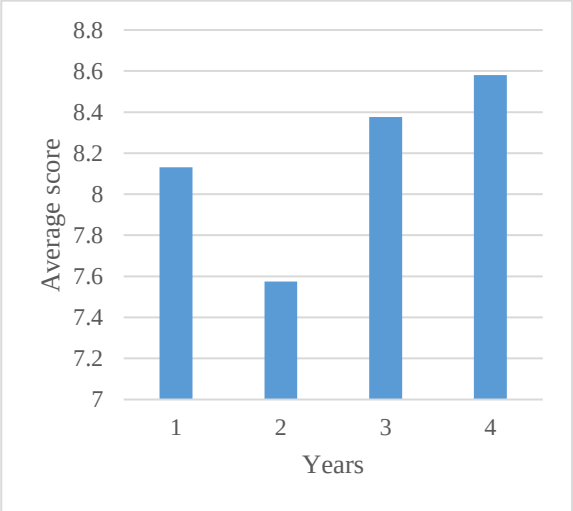


Fig. 2. The academic achievement of the students of the Faculty of Management, Economic Engineering in Agriculture and Rural Development USAMV.
Source: Own calculations based on data of the Survey.

First, we can mention the rating of performance assessed through data envelopment analysis techniques which, compared to the average score of academic success, can serve as an indicator of overall evaluation.

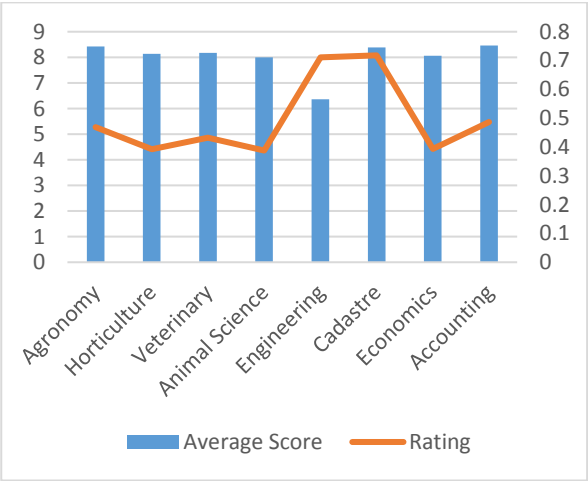


Fig. 3. Evaluating students' academic performance through the DEA rating compared to the average score for different faculties of UASVM.

Source: Own calculations based on data of the Survey.

The information presented above highlights higher academic performance for technical specialities compared to economic specialities. For example, despite the fact that the Faculty of Accounting has recorded a fairly high average score m = 8.46, it shows a relatively low r = 0.48 according to the rating accomplished per 24 types of activities included in the survey and subsequently processed using the principal component analysis method up to six eigenvalues with the superunit values of own vectors. Conversely, the Faculty that has the lowest average score m = 6.36 records a high rating of r=0.71 of academic performance evaluated per those 24 types of activities included in the survey [5].

Table 1. Academic performance of UASM students on foreign language learning skills.

	English	French	Spanish	Russian
Score 3rd	7.87	8.05	7.96	8.86
Rating 3rd	0.71	0.78	0.73	0.79
Score 4th	8.39	8.31	8.25	8.49
Rating 4th	0.48	0.47	0.44	0.52
Score 6th	8.17	7.96	8.14	7.92
Rating 6th	0.42	0.34	0.43	0.35

Source: Own calculations based on data of the Survey.

A significant indicator in assessing students' academic performance is the level of foreign language learning in the university. For example, English, being a traditionally accepted means of communication both in the academic environment and private life, represents a sensitive threshold of individual's ability to fit into foreign society. Students internships offered by the Erasmus+ and other programmes require a good level of English that could be checked by Toefl scores application programs. Of the total number of 324 surveyed students, only 77% study English. There are also students who study at the same time two or three languages and they represent 56% of the total sample. Students with the highest English language skills account for 14% of the total sample and have a DEA rating higher than the arithmetic mean. Also, the study of Russian language represents an exceptional performance in the educational process at the State Agrarian University of Moldova. The 3rd year students who record a definitely higher DEA rating and average score are those who study in Russian. Spanish and French are very important in the teaching process and the academic performance of students ranges between the values of good and very good.

Intermediate values of the average score and the DEA rating for French, Spanish, and Russian show that the study of these languages is not of primary importance in the teaching process.

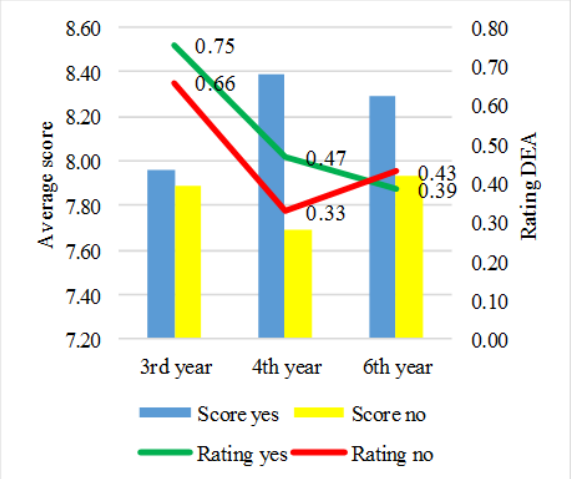


Fig. 4. Distribution of academic performance of UASM students regarding the scholarship.
Source: Own calculations based on data of the Survey.

According to Fig. 4, the students who benefit of scholarship have a definitely higher average score in all years of study. This is obviously due to the fact that the scholarship is calculated based on the average grade during the evaluation session. In the total of the surveyed sample, 71% of the enrolled students receive scholarships, which is an obvious advantage for the university. The professional orientation of high-school students during admission to universities has an additional argument for choosing UASM for studies due to the high rate of students receiving scholarships compared to other higher institutions in the country.

For example, the average score for the 4th year students receiving the scholarship is 8.39, which exceeds by 9.1% the average score of the students who do not receive scholarships.

The DEA rating of the 3rd and 4th year students also repeats the upper academic performance trend for scholarship students, representing respectively 13% for the 3rd year and 42% for the 4th year student.

Table 2. Rotated component matrix of eigenvalues vectors of the factors included in the model

No.	Faculty	Component					
		1	2	3	4	5	6
1	Faculty	0.685	-0.239	-0.337	-0.142	-0.14	-0.023
2	Academic year	0.633	-0.195	-0.516	-0.243	-0.141	-0.046
3	Age	0.519	-0.407	-0.385	0.013	-0.247	-0.096
4	If_no 1	0.424	0.209	0.262	-0.164	0.134	-0.181
5	If_no 2	0.392	0.067	0.224	-0.188	0.012	0.013
6	Yes_residence	0.359	-0.117	0.117	0.354	0.15	0.008
7	Yes_others	0.346	-0.154	0.281	0.342	0.114	0.022
8	If_no 3	0.335	0.022	0.202	-0.162	-0.085	0.036
9	No_business	0.324	0.05	-0.029	-0.179	-0.116	-0.256
10	Yes_scholarship	0.25	0.248	-0.143	0.195	0.162	0.193
11	If_yes 1	0.194	0.083	-0.02	0.08	0.186	0.088
12	Publications	-0.158	0.049	-0.009	0.133	0.065	-0.118
13	Foreign Language	-0.124	0.061	-0.054	-0.024	0.014	0.01
14	Life_priority 1	0.116	0.503	-0.094	-0.119	-0.267	0.212
15	Life_priority 2	0.076	0.452	-0.077	0.179	-0.123	-0.059
16	Life_priority 3	0.284	0.426	0.071	-0.062	-0.132	0.269
17	Life_priority 4	0.22	0.377	0.036	-0.23	-0.22	0.116
18	If_yes 2	0.056	0.373	-0.247	-0.013	0.261	0.133
19	Life_priority 5	0.039	0.368	-0.111	0.243	-0.195	-0.247
20	If_yes 3	0.14	0.357	-0.29	0.196	0.158	0.321
21	Studies	-0.315	0.342	0.228	0.185	-0.151	-0.245
22	If_no 4	0.256	0.31	0.176	-0.218	-0.121	-0.101
23	If_no 5	0.209	0.282	0.175	-0.169	0.224	-0.195
24	No_others	-0.069	-0.206	-0.069	0.073	-0.045	0.092

Source: Own calculations based on data of the Survey

The advantage of evaluating students' academic performance through the DEA rating compared to the average score of current success is obvious as it includes complex information obtained based on the

survey performed per 24 types of activity and three levels of performance assessment [2].

The method of principal component analysis performs the grouping of the variables included in the survey and the performance levels through the own vector technology of the coordinate system. According to the probability theory we have the equality of the overall dispersion to the sum of the partial dispersion of the factors included in the model, the cumulative sum must be 100%. Own vectors that have a overunit value of the components are included in the simplified model of variables with the partial values of each factor.

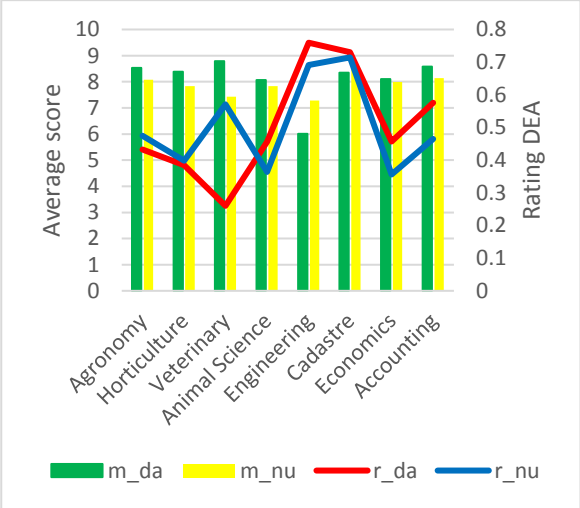


Fig. 5. Evaluating the students' academic performance through the DEA rating compared to the average score for different faculties of UASM depending on their participation in the scientific conferences.
Source: Own calculations based on data of the Survey.

The criterion of inclusion of the given factor in the Rotated component matrix is the maximum module value of own vector decomposition in components. The study undertaken in this paper involves 24 factors that were grouped into six own vectors with the overunit value of the component matrix.

An important indicator of students' academic performance is their participation in the scientific conferences at the university for the 1st, 2nd and 3rd cycles of study. Traditionally, the scientific event takes place in spring: March or April of the academic year and involves a serious preparation of the scientific content of the submitted reports. The best research projects are awarded at the institutional level and those highlighted by excellence are published in the collection of scientific articles edited at the university printing house.

Figure 5 presents the results of students' academic performance depending on whether or not they participate in the scientific conferences per faculties. The figures recorded by the Faculty of Agricultural Engineering, where students' average score participating in the student scientific conference is 6.01 and the non-participation in the research activity shows a current success of 7.27 do not represent a specific trend for UASM.

The distribution of the average score rate for other faculties shows a positive trend for the students participating in the scientific activity and, conversely, it can be argued that the arithmetic mean of the academic performance of students who were not included with presentations in the student conference is 18% lower. The advantage of student evaluation through the DEA rating, which is an overall indicator of performance contributing with 24 different parameters of the academic activity is obvious for the faculties of agricultural engineering and cadastre.

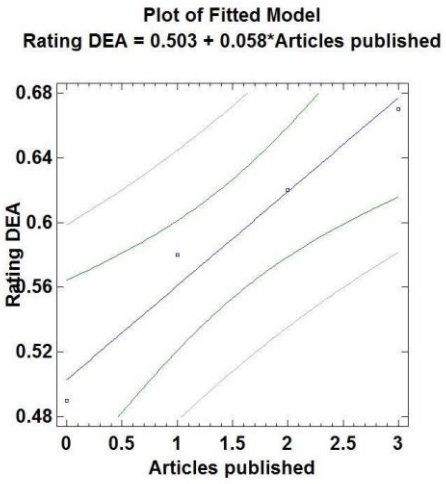


Fig.6. Linear regression of dependence of students' academic performance through DEA rating compared to the number of publications at the UASM student scientific conference.
Source: Own calculations based on data of the Survey.

For the Faculty of Agricultural Engineering the rating evaluated for the students participating in student scientific conferences is by 7% higher and it obviously reflects

accurately the academic performance relative to the average score of current success. Therefore, it is preferable to use the DEA rating concomitantly with the principal component analysis with the purpose of rating higher education institutions for different types of activities.

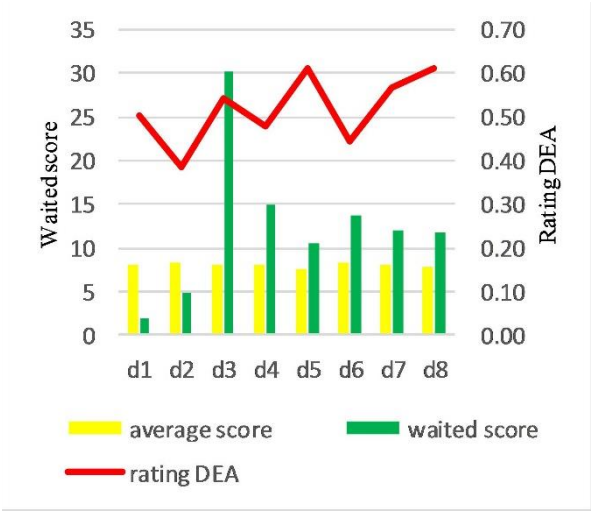


Fig. 7. Distribution of graduates by areas of employment.
Source: Own calculations based on data of the Survey.

The rational selection within the coordinate system of eigenvalue vectors gives the possibility to highlight the significant relationships between the factors included in the model. Figure 6 presents the functional relationship between the number of publications at the students' scientific conference and the academic performance. Thus, if we increase student participation in scientific conferences by 1%, the academic performance increases by 0.14%. This behavior shows a positive trend in the quality of studies depending on students' involvement in research activities. Selecting an interesting and attractive subject of research for students represents the primary responsibility of the teaching staff in the higher education institutions. The high determinant coefficient of functional relationship of 95% proves a close interdependence between students' academic performance and academic research in the university.

Evaluating the career plans of UASM students after graduation, we could identify their employment priorities, which closely correlate with the academic performance determined through the DEA rating. The survey highlights eight distinct areas demanded by the students from the Republic of Moldova:

d1 - education; d2 - research; d3 - public institutions (ministries, agencies, etc.); d4 - private agricultural companies; d5 - non-agricultural private companies; d6 - own business (agricultural); d7 - own business (non-agricultural); d8 - others.

Figure 7 shows the distribution of employment applicants within the indicated areas correlating the academic performance evaluated by the rating method, depending on the average score of the surveyed students. The most requested field of employment after the graduation is a public institution (budgetary employees) that refers to ministries, state agencies, public service organizations, etc. representing a share of 30% of the whole sample. The low demand of graduates regarding their inclusion in educational institutions of 1.86% reflects students' inadequate interest in this field. This denigrating attitude can be explained by very low and insufficient salaries of people employed in education and the low-level privileges granted by the society to this sector. The average score of current success for jobseekers in education after the graduation from UASM is 8.07 and it is a top priority occupying the 6th place among the above presented areas. A broader evaluation of this area through the DEA rating shows a sufficiently high attitude for jobseekers in the education sector r = 0.51 which corresponds to the arithmetic mean of academic performance for all areas. The area d3 has a high rating above the arithmetic mean and represents the value r=0.54 that correlates with the high demand for this field. Therefore, the average score of 8.14 corresponds to a higher demand in the evaluated sample. Regarding the area to set up an agricultural business, the average score of applicants for employment is 8.27 and it is ranked first in the order of preferences. This suggests that students who are evaluated during their studies hope to start their own business in agriculture. However, urban pressing reduces the share of applicants down to 13% of the surveyed students and the academic

performance rating is situated below the arithmetical mean of the sample and represents 0.44. Similarly, becoming employed in an agricultural company after graduating from university indicates a fairly high average score rate of 8.19, which together with a share of 14% of applicants represents a significant direction in the professional orientation of students. The DEA rating of d4 is of 0.47 and reflects a demand below the arithmetic mean based on the overall academic performance indicator.

CONCLUSIONS

Traditional employee performance appraisal as output/input ratio has a relative aspect and the evaluation techniques define the decision making units by numerical indicators that exploit economies of scale. As a criterion for the evaluation of the academic performance rating, it is suggested to use the distance output function, which involves a non-parametric approach of the decision making factors.

The primary data for the academic performance appraisal in the agricultural higher education institution and organizations in the field of agricultural science and innovation were collected in a standard format defined by the Ministry of Education of the Republic of Moldova. The sample of data is representative and reflects objectively all the methodical-didactic, scientific and research activities by including the whole institutional staff into the investigation procedure. The database developed for the storage of primary data allows statistical processing and nonparametric modeling for the evaluation of academic performance indicators in institutions.

REFERENCES

[1]Abbott, M., Doucouliagos, C., 2003, The efficiency of Australian universities: a data envelopment analysis. Economics of Education Review. Vol. 22(1):89-97.

[2]Agha, S.R., Kuhail, I., Nabi, N.A., Salem, M., Ghanim, A., 2011, Assessment of academic departments efficiency using data envelopment analysis. Islamic University-Gaza, Journal of Industrial Engineering and Management. Vol.4 (2): 301-325.

[3]Cooper, W., Seiford, L., Tone, K., 2001, Data envelopment analysis: A comprehensive text with models, applications, references and DEA-solver software. Kluwer academic publishing, 85.

[4]Tomiţa, P., Racul, A., Toma, E., 2018, Comparative analysis of academic performance within the higher education institutions and organizations from the field of science and innovation with agronomic profile from the Republic of Moldova. Scientific papers of the International Scientific Symposium "Prospects of sustainebale development of the rural area in the context of the new economic challenges, UASM, Vol.50, 48-52.

[5]Tyagi, P., Yadav, S., Singh, S., 2009, Relative performance of academic department using DEA with sensitivity analysis. Evaluation and Program Planning. Review. Vol. 32(2): 168-177.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

HUMAN RESOURCES IN THE REPUBLIC OF MOLDOVA AGRICULTURE: PAST, PRESENT AND FUTURE

Ion CERTAN, Simion CERTAN

University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile:+40724 6619 77, Emails: ioncertan@gmail.com, simcertan@hotmail.com

Corresponding author: ioncertan@gmail.com

Abstract

The aim of the present study is to continue the investigation of the evolution of the number, professionalism and creativity of those employed in the national agriculture in order to elaborate some proposals regarding the efficient use of the human potential in the respective branch of the national economy. There was a constant decrease in the number of the population, both due to a decrease in the natural increase and an increase in the number of emigrants. At the same time, the proportion of the population in rural areas is increasing, which obviously needs to be secured by jobs. Even if the employment rate in agriculture has fallen from 42.8% in 1995 to 32.0% in 2015 or by 10.8 percentage points it remains clearly higher than the EU Member States and neighboring countries. The share of persons with higher education in agriculture fell from 11% in 2000 to 5% of all those with higher education in 2017 or 6 percentage points. In the agriculture of the Republic of Moldova dominate those with gymnasium studies, which are 36.5%. We consider it appropriate to develop and apply economic mechanisms that can contribute to the natural growth of the population, especially the rural ones. to halt or at least to temper the emigration of the citizens of our country, especially of the youth, by elaborating and implementing ways that would equalize the incomes of the rural population with that of our country, to make the training of those who will activate in the national agriculture more efficient.

Key words**:** *agriculture, human resources, efficiency*, *professionalism, creativity*

INTRODUCTION

The level of development of agriculture, indisputably, is dependent on the human potential that highlights the natural, material, financial, informational resources available. It is natural to always show a keen curiosity and at the same time awaken to the human potential available to national agriculture, to the performance and creativity of those trained in agriculture to achieve the desired result.

Aspects regarding the study of the human potential of the Republic of Moldova have been exhibited in various national and international publications. Thus, for example, in 2017, Olga Gagauz and Irina Pahomi in the Center for Demographic Research at the National Institute for Economic Research of the Republic of Moldova published the "Full Territorial Demographic Security Index: Dynamics 2014-2016"; Leonid Boaghe, in no. 2 in 2018 of the Journal of Public Administration presents "Human resources management within the local public administration of the Republic of Moldova: problems and solutions"; PhD student ASEM Olga Buiucli in volume II of the collection of selective articles of the Conference International Scientific Conference "Competitiveness and Innovation in the Competitive Economy" from 22-23 September 2017 presented the "Human Resources Behavior on the Labor Market of the Republic of Moldova". This list can be extended. Certainly, various aspects of human resources in agriculture are being investigated. However, the evolution of the agro-food sector caused by the demonopolisation of state property over the land, the establishment and development of "peasant farms (based on real economic independence") undoubtedly requires the amplification and efficiency of scientific researches on human resources trained in agriculture has led us to continue studying the human potential available to national agriculture.

MATERIALS AND METHODS

In research we have used our previous materials and other publications that helped us to understand and explain the specific phenomena regarding human resources in agriculture of Republic of Moldova.
In order to estimate their impact on the development sustainability of the national agro-food sector we use quantitative analysis both for the number of people enrolled in this branch of the national economy and their professionalism requirements that gave us relevant meanings and explanations, which generate some proposals with regarding the assurance of the national agriculture with the necessary human resources.

RESULTS AND DISCUSSIONS

For all countries, including Republic of Moldova, agriculture has been, is and will remain the support of human existence and is therefore the most powerful factor influencing economic and social stability. In our country agriculture is also the backbone of the national economy.
Production of agricultural goods remains important for the national economy even if their contribution to GDP formation is reduced from 29.0% in 1995 (Table 1) to 11.6% in 2017, yielding 0.4% relative to industry.

Table 1. Contribution of the main economic activities to gross domestic product (GDP), (%)

	1995	2000	2005	2010	2015	2016	2017
GDP	100	100	100	100	100	100	100
Of which: - agriculture	29.0	25.0	16.4	11.9	12.3	12.3	11.6
- industry	25.0	16.0	15.8	13.3	12.3	12.2	12.0
- trade	8.0	13.0	10.4	12.9	13.7	14.2	15.2
- other	38.0	46.0	57.4	61.9	61.7	61.3	61.2

Source: Own calculation based on Statistical Yearbooks of the Republic of Moldova

The total agricultural output, in current prices, increased about 8 times from 4,243 mil lei in 1995 (Table 2) to 34,142 mil lei in 2017.
This growth is mainly caused by prices. If in 1995-2005 the global agricultural production in current prices increased by 3 times and in 2005-2014 - by 1.9 times, then in comparable prices of 2000 - by only 10.8% and comparable of 2005 - with 4 percent. The vegetable production registered the most spectacular growth by 9 times from 2,687 Mil. Lei in 1995 to 24,435 Mil. Lei in 2017.

Table 2. Global agricultural production, in current prices, Mil. Lei

	1995	2000	2005	2010	2015	2016	2017
Total production, of which:	4,243	8,268	12,688	19,873	27,193	30,362	34,142
-vegetal	2,687	5,790	8,449	13,616	18,082	21,098	23,435
-animal	1,393	2,202	3,851	5,786	8,584	8,768	9,191
-services	163	276	388	471	527	496	516

Source: Own calculation based on Statistical Yearbooks of the Republic of Moldova

The agrarian reform, initiated by the Moldovan Parliament's decision in 1991, has generated major changes in the structure of the agricultural product. Within 1995-2017 period agricultural production was dominated by crop production that practically constantly decreased from 70.0% in 1995 (Table 3) to 58.0% in 2015 and then increased to 73.6% in 2017 [2].

Vegetable crops show the grain crop weights ranging from 18.8% in 2010 to 26.5% in 2016. If in the 1990s fruit was 17%, then in the years 2000-2017 their share ranges from 3.0% in 2000 to 9.2% in 2017. Only in 2017 fruit, nuts, berries and grapes together reached the share of fruit in the 90s, forming 17.7% that is 8.2% smaller than the share of cereals.
More than 80% of the area cultivated in the Republic of Moldova is covered by so called

cash crops such as cereals, oilseeds, and sugar beet and fodder crops. Only cereals (including wheat, corn and barley) occupy more than half of the sown areas.

Fruit and vegetables occupy less than 20% of the cultivated area.

Table 3. Structure of agricultural production by branches in households of all categories, %

	1995	2000	2005	2010	2015	2016	2017
Total agricultural production	100	100	100	100	100	100	100
a. vegetal, of which:	70.0	69.0	68.9	66.2	58.0	72.2	73.6
- cereal crops	19.0	25.0	22.9	18.8	20.3	26.5	25.9
- vegetables	7.0	5.0	7.3	7.4	7.1	7.0	5.8
- fruits, nuts, berries	7.0	3.0	4.4	3.9	6.5	8.0	9.2
- grapes	9.0	12.0	12.8	12.1	7.0	7.0	8.5
b. animal, of which:	30.0	31.0	31.1	33.8	42.0	27.8	28.4
cattle, poultry meat	16.0	14.0	14.8	18.9	25.9	15.9	15.3
- milk	10.0	13.0	10.9	10.2	10.7	6.2	6.6
- eggs	3.0	4.0	4.4	4.0	3.5	2.9	3.0

Source: Own calculation based on Statistical Yearbooks of the Republic of Moldova.

The trend of increasing the share of animal production from 30% in 1995 to 42% in 2015 due to massive state support and the subsequent reduction to 27.8% in 2016, registering a slight increase (28.4%) in 2017. In the structure of livestock production, cattle and poultry production dominate between 14% in 2000 and 25.9% in 2015.

Changes that have taken place in the structure of agricultural production indicate a tendency to decrease the share of intensive crops such as grapes, fruits, vegetables, tobacco etc. and increasing the share of products that require less capital such as wheat, corn, sunflower and others. Obviously, such a structure of agricultural production generates low levels of efficiency. This situation was confirmed in the "Moldova's Agriculture and Rural Development Strategy 2014-2020". Paragraph 11 of the strategy notes that "The low profitability of the agricultural sector is determined by the dominant position of low-value crops in agricultural production at the expense of high-value crops." Both the structure of agricultural production and the situation in each segment of agriculture is determined by the available resources among which human resources have a decisive role to play.

The Human Potential of the Republic of Moldova

The total population in our country is slightly decreasing to 4,361.6 thousand persons in 1990 (Table 4) to 4,347.9 thousand in 1995 due to the fact that in 1995 the statistics no longer include the inhabitants of the districts on the left bank of the Dniester river.

Table 4. Stable population by environment

	Population (thousands)			% of total		Natural growth		
	total	urban	rural	Urban	rural	total	urban	rural
1990*	4,361.6	2,069.3	2,292.3	47.4	52.6	8.0	9.3	6.6
1995	4,347.9	2,033.0	2,314.9	46.8	53.2	0.8	1.5	0.2
2000	3,644.1	1,514.2	2,129.9	41.5	58.5	-1.1	-0.4	-1.8
2005	3,600.4	1,476.0	2,124.4	41.0	59.0	-1.9	-0.4	-3.0
2010	3,563.7	1,476.7	2,087.0	41.4	58.6	-0.9	1.1	-2.3
2015	3,555.2	1,507.3	2,047.9	42.4	57.6	-0.3	0.2	-0.8
2016	3,553.1	1,511.1	2,042.0	42.5	57.5	-0.3	0.4	-0.8
2017	3,550.9	1,516.8	2,034.1	42.7	57.3	-0.8	-0.1	-1.3
2018	3,547.5	1,521.9	2,025.6	42.9	57.1	-	-	-

Source: Own calculation based on Statistical Yearbooks of the Republic of Moldova.

After 1995, the population continued to decrease to 3.55 million in 2018. Natural population growth declined from 8.0 in 1995 to -0.8 in 2017.

The share of population in rural areas increases from 52.6% in 1990 to 59.0% in 2005 due to internal migration from city to village, then has a clear tendency to decrease

slightly, forming 57.1% of the total population in the year 2018. If the natural increase in the urban area has diminished since it is reduced from 9.3 in 1990 to -0.1 in 2017, then in the rural area respectively from 6.6 to -1.3.

The coefficient of aging (the number of people aged 60 and over) continuously increases from 12.8 in 1990 (Table 5) to 17.7 in 2017 or 4.9 units.

Table 5. Number of persons aged 60 and over per 100 inhabitants

	Total			Urban			Rural		
	total	male	female	total	male	female	total	male	female
1990*	12.8	10.4	15.0	10.1	7.8	12.1	15.2	12.6	17.5
1995	13.1	10.7	15.3	10.1	8.1	12.1	15.6	13.0	18.0
2000	13.6	11.2	15.9	11.0	9.0	12.9	15.5	12.8	17.9
2005	13.6	11.0	15.9	11.8	9.9	13.6	14.8	11.8	17.5
2010	14.4	11.8	16.8	13.2	11.3	15.0	15.2	12.2	18.1
2015	16.7	13.8	19.3	16.6	14.0	18.8	16.8	13.7	19.7
2016	17.2	14.2	19.9	17.3	14.6	19.6	17.1	14.0	20.1
2017	17.7	14.8	20.5	18.0	15.2	20.4	17.6	14.5	20.1

Source: Own calculation based on Statistical Yearbooks of the Republic of Moldova

So, over the years indicated in the table, the number of people aged 60 and over exceeds the admissible level of demographic aging (12%) indicated on the G. Bojio-Gamier scale. The coefficient of male aging in those years increased from 10.4 to 14.8 or 4.4 units, and for women - from 15.0 to 20.5 or 5.5 units [5]. The evolution of the aging coefficient in the village differs. In 1990 the number of persons aged 60 years and over exceeded the total in the Republic of Moldova by 2.4 units, including men - by 2.2, in women with 2.5. In the years 2016 and 2017 the number of people aged 60 years and over in rural areas was lower both in relation to those in the urban and the total country.

Human potential is part of the resources that can circulate freely throughout the territory. As of April 28, 2014 [1], the citizens of our country, can travel without visas into the European Union, which undoubtedly is an advantage for those who travel. However, the situation created in the national economy has forced the population, especially young people, to look for work abroad, which has spurred the emigration of the population.

Table 6. Population working abroad, thousands

Age	Gender	2000		2005		2010		2015		2016		2017	
		total	rural	total	rural	total	rural	total	rural	Total	rural	total	rural
Total	Total	138.3	82.1	394.5	282.1	311.0	220.5	325.4	223.9	319.0	224.9	318.4	221.8
	Male	93.1	56.5	262.8	190.8	198.0	143.3	210.8	143.3	212.3	146.3	211.3	144.2
	Fem	45.2	25.6	131.7	91.6	113.0	77.1	114.6	80.6	106.8	78.6	107.2	77.0
15-24	Total	53.8	37.3	120.0	99.1	69.7	57.3	60.6	48.4	58.1	47.9	50.7	40.3
	Male	34.6	24.7	79.8	65.0	56.6	42.5	44.8	36.6	43.6	35.9	35.3	28.8
	Fem	18.5	12.6	40.2	34.1	18.1	14.9	15.8	11.8	14.5	12.0	14.4	11.5
25-34	Total	37.9	20.9	111.5	75.5	102.2	70.5	125.9	83.4	120.9	82.8	121.6	81.6
	Male	26.6	15.0	78.2	52.1	70.3	48.9	90.6	58.7	91.3	60.6	89.8	60.8
	Fem	11.3	5.8	33.3	23.4	31.9	21.6	35.2	24.7	29.7	22.2	31.9	20.8
35-44	Total	33.4	17.8	93.6	65.0	68.6	48.9	70.3	46.7	71.1	47.5	72.9	51.5
	Male	22.5	12.2	61.5	44.8	40.0	29.0	43.4	26.6	43.9	28.4	46.1	31.3
	Fem	10.9	5.6	32.1	20.1	28.6	19.9	26.9	20.1	27.2	19.1	26.9	20.2
45-54	Total	13.0	5.8	63.0	39.9	58.3	37.3	50.6	33.6	49.5	34.2	52.9	35.6
	Male	8.6	4.3	38.6	26.6	29.7	19.9	23.9	16.1	24.8	16.4	30.0	19.0
	Fem	4.3	1.5	24.4	13.3	28.5	17.4	26.7	17.6	24.7	17.8	22.9	16.6
55	Total	0.8	0.3	6.2	2.9	12.2	6.4	17.4	11.2	18.6	11.9	19.6	12.2

Source: www.mold-street.com/?go=news&n=7779, Accessed 02.03.2019

The total population in our country working or looking for work abroad increased from 138.3 thousand persons in 2000 (Table 6) to 311 thousand persons in 2010 or 2.25 times, then practically stabilized oscillating slightly reached 318.4 thousand people in 2017 or about 2.4 percent.

Note that according to the data of the

diplomatic and consular missions of the Republic of Moldova in the host countries the estimated number of Moldovan citizens living abroad was increased from 505,139 in 2011 to 983708 in 2014 and decreases to 805,609 in 2015. We will not comment on the situation, we will analyze the information presented on http / www.statistica.md.

The number of people living in the countryside working or looking for work abroad has increased from 82.1 thousand persons in 2000 to 220.5 thousand people in 2010 or 2.69 times and constantly increases to 224.9 thousand in 2016 decreasing to 211.8 in 2017 or by about 2 % compared to 2010. Those at work or looking for work abroad from rural areas in 2000 formed 59.4 of the total country or by 0.9 percentage points more than the share of the resident population (58.5%), and in 2017 - 66.5% or by 9.2 times (57.3%) than the share of the rural population in that year.

The total number of women working or looking for work abroad has increased from 45.2 thousand in 2000 to 107.2 thousand in 2017 or 2.37 times, and in the rural area from 25.6 thousand to 77. 0 thousand or about 3 times. If in 2000 every woman in the rural area working or looking for work abroad had 2.2 men, then in 2017 - 1.87 men.

According to the diaspora mapping study carried out by the International Organization for Migration (IOM) experts, mission in Moldova, over 70 per cent of Moldovan emigrants are young people up to 40 years of age. The selected and processed information shows that in 2000 the number of those aged between 25 and 44 from the rural area working or looking for work abroad amounted to 38.7 thousand persons (47.1% of the total number of those left of rural space) and rises to 133.1 thousand persons (60.0% of all those left out of rural areas) in 2017.

In the same ILO study it is claimed that emigrants study. Thus, the data of an annual report in the Moldovan medical field shows that "in the first years after independence Moldova had over 45,000 nurses and around 16,300 physicians, in 2017 their number reached 25,125 and, respectively, 13,021, the main cause being the migration of medical staff.

Those who leave our country looking for a job abroad largely engage in unskilled jobs. Most women work in the field of domestic services, child and sick care and hotel services, and men work in construction and transport.

The diaspora mapping survey conducted between February 2016 and February 2017 in seven ILO expert countries shows that the absolute majority of the population in our country working or looking for work abroad integrates well in destination countries. This research states that "if in the past years the main objective of our countrymen in the process of integration in another country was legalization, more and more people want recognition of diplomas obtained in Moldova in recent years".

Emigrants from our country do not see us returning home. The reasons for this decision are the lack of confidence in the political system and the precarious situation in the national economy. According to the Garda newspaper in December 2016 and until mid-2017, the presidency issued 4 decrees signed by Igor Dodon, through which 612 people, including 139 children, gave up the Moldovan citizenship. Natural growth and population emigration strongly influenced the number of those working in the Republic of Moldova.

Human Resources in National Agriculture

Adam Smith's statement "Human activity creates the mass of goods" is perfectly valid for agriculture as well. The economically active population, which in 1995 was 1,696 thousand persons (Table 7), has a clear tendency to decrease to 1,259 thousand persons in 2015 or 25.77%.

The activity rate of 47.1% in 1995 decreased to 35.5 percent of total national human resources.

In other words, in these years the share of the economically active population in the total national human resources decreased by 11.6 percentage points.

Table 7. Labor force in the Republic of Moldova, thousands

	1995	2000	2005	2010	2015	2016	2017
Population, total	3,604	3,639	3,595	3,582	3,555	3,552	3,549
Of whjch: economically active	1,696	1,655	1,422	1,235	1,266	1,273	1,259
share, %	47.1	45.4	39.5	34.7	35.6	35.6	35.5
Of which in real sector of economy	1,673	1,515	1,319	1,143	1,203	1,220	1,207
share, %	46.5	41.2	36.6	32.1	33.8	34.3	34.0
Of which in agriculture	711	765	537	315	382	411	390
share, %	42.8	50.5	40.7	27.5	31.7	33.7	32.3

Source: Own calculation based on Statistical Yearbooks of the Republic of Moldova.

The employed population in the economy of the Republic of Moldova decreases from 1673 thousand persons (98.64% of the economically active population) in 1995 to 1,207 thousand persons (95.87% of the active population) in 2017 or by 27.85% [4].

The number of those employed in agriculture decreased from 711 thousand (42.5% of the total employed in the national economy) in 1995 to 390 thousand (32.3% of the total employed in the national economy) in 2017 or 1.86 times. The employment rate in agriculture has fallen from 42.8% in 1995 to 32.0% in 2015 or by 10.8 percentage points.

Table 8. Distribution of population by age, thousands

	Year	Total	of which:					
			15-24	25-34	35-44	45-54	55-64	65 and over
Employed population	2005	1,319.0	124	252	341	384	158	60
	2015	1,204.0	93.6	300	293	290	190	37
	2016	1,219.5	84.9	312.6	297.1	280.8	200.8	43.3
	2017	1,207.5	79.8	302.1	301.9	267.9	209.7	48.1
Of which: - in rural area	2005	745.0	71.9	121	184	222	93.4	52.8
	2015	648.0	56.2	138	159	161	108	25.8
	2016	659.7	47.6	145.7	155.5	163.4	118.2	30.2
	2017	657.4	45.8	130.6	159.9	162.1	127.3	31.8
Of which: in agriculture	2005	512.5	39.0	74.1	119	155	73.9	51.3
	2015	358.4	30.9	62.7	81.6	87.4	71.8	23.9
	2016	410.9	27.5	76.7	91.0	99.3	85.5	30.9
	2017	390.5	24.9	63.4	89.0	92.7	88.8	31.7

Source: Own calculation based on Statistical Yearbooks of the Republic of Moldova.

In 2005 the employed population in the national economy aged between 25 and 54 was 977 thousand persons (Table 8), and in 2008 it numbered 871.9 thousand persons or 10.8% less.

The number of persons aged 25-54 employed in agriculture decreases from 348.1 thousand persons (35.63% of the total number of employed) in 2005 to 245.1 thousand persons (28.11% of the total employed) in 2015 or about 30 percent.

Among the employed population in the national economy in 2005 dominates the 45-54 age group, (29.1% of the total employed population) in 2015, 2016, 2017 respectively by 300 thousand (24.9%), 312.6 thousand (25.6%) and 302.1 thousand (25.0%) prevailed in the population aged 25-34 years. The population aged 45-54 was among those employed in agriculture.

The number of those employed in agriculture aged 15-24 decreased continuously from 39.0 thousand persons (7.6% of all employed in agriculture) to 24.9 thousand people (6.37% of the total employed in agriculture) in 2017 or by 36.2%. In 2005, the total number of people aged 60 and over was 60 thousand people, including agriculture 51.3 thousand (85.5% of the total) and in 2017 respectively 48.1 thousand and 31.7 thousand or 65.9%.

After February 15, 1991 when the "Concept of agrarian reform and socio-economic development of the village" was adopted and implemented, there were considerable changes in the structure of the employed population according to the form of ownership in the national agriculture.

Table 9. Population employed, thousands

		Economic activities	Of which private	Inclusive in rural area	Of which private
2000	total	1,514.6	1,036.1	936.1	748.5
	Agriculture	770.4	717.8	713.3	664.6
2005	Total	1,318.7	918.0	745.1	596.8
	Agriculture	535.5	525.5	512.5	504.6
2010	Total	1,143.4	745.8	695.0	430.3
	Agriculture	314.7	307.7	295.8	290.7
2015	Total	1,203.6	884.5	648.5	505.0
	Agriculture	381.9	376.8	358.4	354.2
2016	Total	1,219.5	923.9	659.7	525.7
	Agriculture	410.9	405.8	384.2	380.1
2017	Total	1,207.5	898.0	657.4	513.7
	Agriculture	390.5	382.9	368.2	363.7

Source: Own calculation based on Statistical Yearbooks [6] of the Republic of Moldova.

Thus, if in 2000 in the economic activities of the private sector 1,036.1 thousand persons were employed (Table 9) or 68.4% of the total number of those engaged in economic activities and agriculture, the private sector constituted 717.8 thousand persons or 93.17%, then in 2017 - 898.0 (74.37%) and 382.9 (98.05%) respectively.

The total number of those employed in rural areas decreases from 936.1 thousand in 2000 to 657.4 thousand in 2017 or 29.78%. In the rural area, the employment of agriculture, hunting and forestry is definitely dominated, the number of which decreases from 713.3 thousand people in 2000 to 368.2 thousand persons in 2015, including in the private sector - from 664.6 to 363.7 thousand people. The share of those working in the private sector of agriculture in rural areas increased from 93.17% in 2000 to 99.67%.

Spectacular changes have occurred in the ratio of employees, self-employed workers, unpaid family workers and other categories of employed persons. In total, those employed in the national economy dominate the employees even if their number decreases from 830.6 thousand (63% of the total) in 2005 (Table 10) to 787.1 thousand persons (65% of the total) in 2017.

The number of employees in agriculture has decreased from 127.6 in 2005 to 62.9 thousand persons in 2017 or 50.7 per suite. Among the employed in agriculture are self-employed workers whose number amounted to 372.0 thousand (72.6% of the total) in 2005, and in 2017 - to 288.6 thousand persons (77.8% of the total).

Table 10. Population by type of employment, thousands

	2005	2017	2005	2017	2005	2017	2005	2017	2005	2017
Total, of which:	1,318.7	1,207.5	830.6	787.1	464.7	370.9	14.6	45.5	8.7	4.1
In rural area, of which	745.1	657.4	339.6	309.1	391.3	301.4	13.1	45.3	7.0	0.0
In agriculture	512.5	390.5	127.6	62.9	372.0	288.6	12.8	44.6	1.69	0.0

Source: Own calculation based on Statistical Yearbooks [6] of the Republic of Moldova.

De facto all unpaid family workers are employed in agriculture. Their number growth by 3 times from 12.8 thousand people in 2005 to 44.6 thousand people in 2017.

Extending private ownership of the land, organizing peasant farms (farming), increasing the number of self-employed workers in agriculture has caused a significant increase in the number of decision-makers that requires professional training in the field to ensure their creativity and productivity, which can be achieved through education, which according to Peter Drucker [3, p.76] is "the first of the challenges of our time".

Table 11. Educational level of population, thousands

		2000		2005		2010		2015		2016		2017	
		total	**rural**	**total**	**rural**	**total**	**rural**	**total**	**Rural**	**total**	**rural**	**total**	**rural**
Total	total	1,514.6	936.1	1,318.7	745.1	1,143.4	605.0	1,203.6	648.3	1,219.5	659.7	1,259.1	675.4
	agriculture	770.4	713.3	536.5	512.5	314.7	295.8	381.9	358.4	410.4	384.2	390.5	368.2
High	total	180.8	46.7	223.8	47.5	262.8	64.2	294.0	72.4	297.4	71.3	309.0	72.1
	Agro	19.9	15.0	13.7	11.5	12.1	9.1	15.7	12.7	17.0	14.1	15.3	12.5
Middle level	total	216.8	88.2	194.3	72.8	180.2	81.0	170.6	78.0	163.8	75.3	165.9	77.6
	Agro	49.5	41.8	32.4	29.4	24.8	22.0	32.7	29.4	33.1	29.3	32.7	29.9
Professional	total	391.0	226.2	331.2	187.3	272.2	170.3	268.1	164.2	268.5	160.0	289.8	173.2
	Agro	183.3	164.9	129.1	119.2	87.1	81.6	92.8	87.3	96.6	90.6	95.4	90.5
Highschool	total	360.4	255.9	294.9	199.8	236.8	138.8	239.1	143.9	231.0	148.0	244.3	151.6
	Agro	212.4	203.0	158.4	154.7	84.3	80.8	97.6	90.6	106.3	98.4	100.1	94.1
Gymnasium	total	277.7	242.1	235.0	200.5	178.1	143.5	224.8	184.1	242.1	198.7	244.7	195.9
	Agro	223.4	214.7	166.6	161.7	99.6	95.8	137.0	132.6	151.7	145.9	142.5	136.7
Primary	total	87.9	77.1	35.9	37.1	8.3	7.3	7.0	6.3	6.8	6.5	5.4	5.1
	Agro	81.9	73.9	36.4	36.1	6.7	6.5	6.1	5.8	6.1	5.9	4.8	4.5

Source: Own calculation based on Statistical Yearbooks [6] of the Republic of Moldova

The total population with higher education increased, in the Republic of Moldova, from 180.8 thousand in 2000 (Table 11) to 309.0 thousand people in 2017 or by 1.7 times.

The number of those with higher education in the rural area in that period increased by only by 1.5 times. The number of those who got a higher education decreased from 20,000 students in 2000, 25% of which in agriculture (19% of those with higher education) to just 15,300 in 2017 (about 20%). Agriculture of the Republic of Moldova is dominated by people with gymnasium studies, which represent 36.5% of the total number of those engaged in agriculture.

One of the most important factors influencing people's activity in agriculture is the income of the population. The monthly income of the total population increased by 568.6 lei in 2005 (Table 12) to 2,244.9 lei in 2017 or 3.95 times, and in the environment rural area increased from 519.2 to 1917.0 lei or 3.69 times.

Table 12. Available incomes and subsistence minimum (monthly average / person)

	2005	**2010**	**2015**	**2016**	**2017**
Income available: - total population. lei	568.6	1,273.7	1,956.6	2,060.2	2,244.9
- rural population. lei	519.2	1,054.7	1,657.5	1,771.3	1,917.0
The subsistence minimum: - total population. Lei	766.1	1,373.4	1,734.1	1,799.2	1,862.4
- rural population. lei	696.9	1,285.2	1,657.7	1,723.4	1,770.5
Revenue available at the minimum subsistence level:	74.2	92.7	112.8	114.5	120.5
- total population.%	74.5	82.1	100.0	102.8	108.3

Source: Own calculation based on Statistical Yearbooks [6] of the Republic of Moldova

The monthly average of the incomes available to the rural population in 2005 was 91.3% of the monthly average of the total population, in 2017 only 85.4%. If the monthly average of the available incomes of the population exceeded the monthly average of the subsistence minimum in 2013, reaching 120.5% in 2017, then in the rural area in 2015 it equaled, reaching 108.3% in 2017, with 12. 2 percentage points less.

CONCLUSIONS

The human potential of the Republic of Moldova is steadily decreasing, as a result of a lot of factors such as negative demographic growth, massive emigration [4] due to economic and social uncertainty, etc.

The share of people enrolled in agriculture out of total national human resources registered slow decrease, but still remains well above the European Union and neighboring countries average.

The level of education of people involved in agriculture is dominated by those with gymnasium and lyceum level [5], often less relevant to the performed activities.

What to do? We consider it appropriate:

- to develop and apply economic and social policies based on local specifics and well as a set of mechanisms and instruments that might contribute to diversification of non-agricultural activities in rural areas. These, later on, must contribute to population natural growth in rural area and in the Republic of Moldova respectively.
- to stop or at least slow down the emigration of our citizens become a myth and we must focus on the development and implementation of methods aiming to return back migrant, particularly the youths, through measures like PARE 1+1, RISP II and other successful programs checked in time with good results within the last 10 years.
- to intensify and make efficient the training of those active and active in national agriculture, which is part of the requirement of the "a" paragraph of Article 123 of the Association Agreement between the Republic of Moldova on the one hand and the European Union and the European Atomic Energy Community and their Member States, of the other part, launched in November 2013, which states that "cooperation will, inter alia, focus on ... promoting lifelong learning, which is the key to growth and jobs and enabling citizens to participate fully in society. " [1]

REFERENCES

[1]Agreement of association between the Rep. of Moldova, on one side, and the European Union and European Community of Atomic Energy and the member states, on the other side (Acordul de asociere între Republica Moldova, pe de o parte, și Uniunea Europeană și Comunitatea Europeană a Energiei Atomice și statele membre ale acestora, pe de altă parte)

[2]Certan, I., Certan, S., 2017, Human potential in agriculture of the Republic of Moldova, Scientific Papers-Series Management Economic Engineering In Agriculture And Rural Development Vol. 17(2).

[3]Drucker, P., About the profession of manager Meteor Press House, (Despre profesia de manager, Editura Meteor press), București, pp.76.

[4]Labor force in the Rep. of Moldova. Employment and Unemployment, 2009, Bureau of National Statistics of the Rep. of Moldova, Chișinău.

[5]Statistica.md, http/www.statistica.md, Accssed on 02.02.2019.

[6]Statistical Yearbook of the Rep. of Moldova, Chișinău, 1995-2017.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ASPECTS OF THE TOBACCO MARKET WITHIN THE EUROPEAN UNION AND A BRIEF MORAL REFLECTION ON SMOKING

Irina Adriana CHIURCIU, Iuliana ZAHARIA, Elena SOARE

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Phone: +4021 3182564, Fax: +4021 3182888, Mobile: +40744 647410, Emails: irina.chiurciu@yahoo.ro, iulia_zaharia@yahoo.com, soare.elenausamv@gmail.com

Corresponding author: irina.chiurciu@yahoo.ro

Abstract

Being transdisciplinary, the work associates an economic and a moral purpose. Economically, the paper analyzes the following indicators specific to the tobacco market in the European Union, such as: areas cultivated with tobacco; total tobacco production; average production per hectare of tobacco; the number of tobacco growers; tobacco consumption per person (for people over 15 years old); the price of tobacco in the main cultivating countries; the value of gross production for the unprocessed tobacco; quantitative imports and exports. This analysis is focused on the period 2011-2017. The results show that in 2017, Italy, Poland, Spain and Greece were the main tobacco growers in the European Union. Bulgaria recorded the largest number of tobacco growers in 2014, and the highest price reached was reached in Greece, Germany, in 2016, ranking third among the world's leading registered tobacco importers. To the economic analysis we associate information about the current and potential uses of the Nicotiana tabacum plant as well as a reflexive moral mark on the impact that smokers (contagious victims) have especially on members of age groups where discernment is not formed (children, pubescent, adolescents) - obtained on the basis of documentation, analysis, synthesis, reflection on the afferent material.

Key words**:** *tobacco, gross production value, exporters, importers, smoking & morality*

INTRODUCTION

Tobacco comes from Mexico and is part of the Solanaceae family, the genus Nicotiana [10].

Currently, 70 tobacco species are known, but Nicotiana tabacum is the most important species from the economic point of view. Nicotiana tabacum was distinguished by the following varieties: Virginia, Burley and Oriental.

Virginia variety is part of the "flue-cured" class (the leaves are dried by a hot air stream) and is characterized by a sweet, mellow, aromatic flavour and it has excellent combustion properties. It is grown throughout the world.

The Burley variety belongs to the "air cured" class (dry out in open air until the leaves get a brown shade). It tastes like a cigar; it is cultivated especially in the US, but also in Europe, Asia, Africa, Central and South America.

Oriental varieties are part of the "sun-cured" class (the leaves are dried by exposure to the sun). They have a very strong flavor and are grown in coastal areas of the eastern Mediterranean, Aegean Sea, Marmara and the Black Sea [9].

According to official statistic data, gross E.U. tobacco production accounts for less than 3% of world production. Currently, the world's leading tobacco producers are: China, Japan and India. Tobacco is grown in 12 countries in the European Union, with the main cultivating countries being Greece, Italy, Poland, Bulgaria and Spain. These cover approximately 85% of the tobacco cultivated

area in the E.U. Due to the decrease in the consumption of tobacco products, the tendency of cultivating this plant on small surfaces appeared. To meet the demand for tobacco products, E.U. imports raw tobacco from Africa and America.
Since 2010 E.U. gave up tobacco quotas and switched to the direct payments system and to the rural development programs in tobacco-growing regions [4].

MATERIALS AND METHODS

For the economic analysis of this study, statistical data relevant to the evolution of the tobacco market in European Union was used. The statistical data was taken from the sites of European Commission / Agriculture and rural development, Eurostat, ITC, FAOSTAT and from other specialized websites. A number of specialized materials have been consulted to better capture the evolution of the tobacco market. The period analyzed in the paper was 2011-2017. The analysis of the tobacco market has been based on several indicators specific to this market, such as: tobacco surfaces; tobacco production; yield per hectare for tobacco culture; the number of farmers cultivating tobacco; tobacco consumption per person (for people over 15 years old); the price of tobacco in cultivating countries; gross production value; imports and exports of unprocessed tobacco.

RESULTS AND DISCUSSIONS

Nicotiana tabacum – a knife with two edges

Nicotiana tabacum (known as Tobacco) is an herbaceous plant, with annual life cycle; it spontaneously grows in South America and has been adapted to many areas of the planet. Nicotine, the main specific substance of the plant, is very toxic: 5-6 mg of pure substance can cause death and 6 drops of pure substance put on a horse tongue cause death [11].
The natives of the American continent used the plant leaves in the past, dried and soaked, for medicinal purposes, as well as for ritual purposes (the pipe of peace). Since it was brought to Europe, for this plant were also found other uses with a supposed curative role, and subsequently, based on the practice results, they were abandoned.
However, insecticidal preparations from the plant (maceration extract/infusion and tobacco powder) are currently used. More and more significantly, within the pharmaceutical industry, the nicotinic acid (vitamin PP) from tobacco is used in the treatment of pellagra, but also for neurological or psychiatric conditions such as Parkinson's disease, Alzheimer's disease, schizophrenia, Tourette's syndrome, peripheral vascular and cutaneous disorders; a derivative, methyl nicotinate, is used in anti-rheumatic, anti-inflammatory and skin circulation activating drugs. There are researchers attributing to tobacco / smoking including, aphrodisiac qualities. Furthermore, it exists in testing phase an anti-decay spray based on the favorable immunological action of tobacco against the caries producing microbe. At the same time, we mention that extensive research is being done to use tobacco as an anticancer plant because it is suitable for genetic manipulation. The tobacco seeds are used for the extraction of edible oil after its previous refining or for the preparation of certain paints, and after the extraction of the oil the seeds get fodder use. Let us mention the melliferous use of this plant with a rich pollen (this paragraph is a synthetic extract from Popescu, O., Achim, A., Popescu, AL., 2012, p 19-20 [11]).
The main “dark side” of Nicotiana tabacum comes from its use (by people!) for smoking, even, apparently or in short term, smoking gives satisfaction. It has to be mentioned that generically, a cigarette contains “nicotine, tar and other 150 chemicals, of which 30% carcinogens” [11].
The act of smoking involves the absorption of 96% of the nicotine particles through the mucosa of the airways and through the pulmonary alveoli, as well as the noxious carbon monoxide, which alters the gas exchanges at the pulmonary level, generating emphysema [11].
The long-term negative effects of smoking include: the smoker's respiratory syndrome (cough, expectoration, dyspnea, vague chest pain, chronic bronchitis, chronic pulmonary emphysema); various cardiovascular diseases

(arteritis, phlebitis, hypertension, heart rhythm disorders, ischemic heart disease, myocardial infarction and / or stroke); neoplasm; digestive sufferings; endocrine disorders; decreasing intellectual and physical capacity; hearing loss or, in time, deafness; psoriasis; toxicomania [11].

Of the many statistical results recorded in major pathologies, we only select that at the end of the 20th century smoking was incriminated as the cause of cancer for one third of global cancer cases and about 85% of cases of lung cancer), cardiovascular disease - 25% of deaths, hypertension - 36% of cases [11]; the World Health Organization has established that smoking kills "up to half of its users", "over 7 million people each year" (6 million as result of direct tobacco use and around 890,000 as result second-hand smoke) and "around 80% of the world's 1.1 billion smokers live in low- and middle-income countries" [16].

Economic analysis

Even if the sale of the main tobacco products is subject to public opinion pressures and health risks are known, around 1 billion people are currently smoking in the world. Also, hundreds of thousands of farmers cultivate tobacco worldwide (see table 4 for the EU number of farmers), millions of people are employed in the tobacco industry, tobacco products are taxed and constitute an important source of income for all states, as it can be seen below [9].

European Union public health specialists have drawn attention to the danger of cancer arising from tobacco use, and the "Europe against Cancer Program" was launched at the end of the 80s [2].

This disease, on the one hand, negatively affects the health of a part of the population, and on the other hand, it contributes to the increase of the annual expenditures incurred by governments for the care of the sick.

At European Union level, due to the negative effects of cigarette consumption, several economic measures have been taken over the years to reduce tobacco consumption among the population [1].

In Table 1 are presented the areas cultivated with tobacco, in 2011-2017, in the main cultivating countries in the European Union. Except for Greece and Portugal, in all the countries under review there is a decrease in the areas cultivated with tobacco in 2017 compared to 2011.

Table 1. Dynamics of tobacco-cultivated areas in the EU in 2011-2017 (thousand ha)

Specification	2011	2012	2013	2014	2015	2016	2017	2017/2011 %
Belgium	0.06	0.00	0.10	0.06	0.05	0.05	0.05	83.33
Bulgaria	21.70	18.20	20.40	17.31	13.36	9.96	7.72	35.58
Greece	14.80	15.69	19.71	21.77	19.41	18.28	16.99	114.80
Spain	10.17	9.66	9.69	10.22	9.02	8.95	8.76	85.84
France	5.99	5.00	4.38	4.26	3.73	3.53	2.88	48.08
Croatia	5.91	5.96	5.17	5.20	4.75	4.41	4.56	77.16
Italy	22.43	14.78	16.04	18.44	15.20	15.72	15.72	70.08
Hungary	6.37	5.63	4.89	4.82	4.72	4.52	3.98	62.48
Poland	15.90	15.00	14.70	14.61	13.40	12.00	12.89	81.07
Portugal	0.03	0.04	0.07	0.10	0.12	0.13	0.05	166.67
Romania	1.68	1.26	0.94	0.86	0.75	0.93	0.80	47.62

Source: [5], own calculations

From the statistical data presented it can be seen that the highest percentage declines registered in 2017, compared with 2011, in the areas cultivated with tobacco were registered in Bulgaria (-64.42%) and Romania (-52.38%). Greece is the leader of the ranking of tobacco growers in the European Union, followed by Italy, Poland, Spain and Bulgaria. At the opposite pole, we find the countries where the smallest tobacco surfaces were grown in 2017, such as Portugal, Belgium, Romania, France and Hungary (Figure 1).

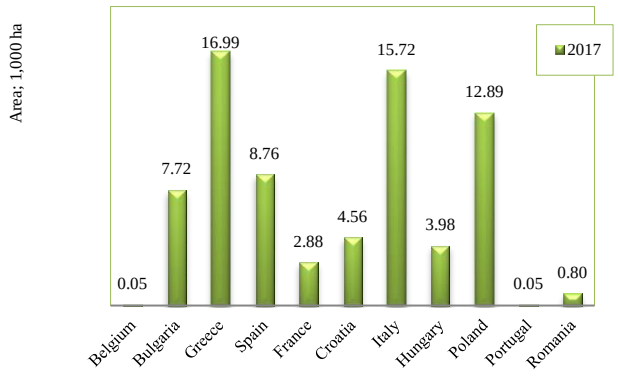


Fig. 1. Tobacco cultivated areas in the European Union in 2017 (thousand ha)
Source: [5]

In the European Union, the number of tobacco growers in the 2011-2014 period registered visible changes. The data presented in Table 2 shows that Bulgaria, Greece and Poland have been highlighted in terms of the number of tobacco growers. In 2014, Bulgaria recorded the largest number of tobacco growers, 23,720. Even though Bulgaria is the leader of the ranking of tobacco growers in the European Union, in 2014, there is a 30.36% decrease compared to 2011. At the European Union level, in 2014, it is noted that the number of tobacco growers has decreased in all the analyzed countries, compared to 2011, with an exception, Portugal. In 2014, the number of farmers in Portugal increased by 54.84% compared to 2011. This increase in the number of farmers in Portugal is not significant for the European Union's tobacco culture economy.

Table 2. Dynamics of tobacco growers in U.E., 2011-2014 (number)

Specification	2011	2012	2013	2014	2014/2011 %
Belgium	72	69	59	59	81.95
Bulgaria	34,060	20,460	26,424	23,720	69.64
Greece	13,426	14,968	12,544	12,627	94.05
Spain	2,191	2,115	1,986	1,894	86.44
France	1,804	1,700	1,177	1,177	65.24
Italy	4,004	2,971	2,768	1,190	29.72
Hungary	1,101	1,100	1,046	1,046	95.00
Poland	12,300	10,000	11,000	9,000	73.17
Portugal	31	26	42	48	154.84

Source: [3], own calculations

At the level of the European Union, the decrease in tobacco-growing areas led to a decrease in production in 2017 compared to 2011 in most countries, with the exception of Greece and Portugal (Table 3).

Table 3. Tobacco production dynamics in the European Union, 2011-2017 (thousand tons)

Specification	2011	2012	2013	2014	2015	2016	2017	2017/2011 %
Belgium	0.19	0.10	0.20	0.00	0.00	0.00	0.00	0
Bulgaria	40.60	28.10	36.45	30.00	23.48	15.21	13.04	32.12
Greece	23.86	24.00	26.71	34.30	30.68	29.89	28.23	118.69
Spain	33.69	32.31	31.33	33.56	29.53	29.24	29.68	88.10
France	14.00	-	-	9.45	9.41	9.13	7.90	56.43
Croatia	10.64	11.79	9.83	9.16	10.13	8.98	9.41	88.44
Italy	70.13	50.62	49.77	53.92	51.41	48.47	48.47	69.11
Hungary	10.92	9.30	8.68	9.46	7.95	8.01	7.56	69.23
Poland	34.40	35.30	30.80	34.89	27.30	31.20	32.49	94.45
Portugal	0.07	0.12	0.19	0.23	0.28	0.15	0.12	171.43
Romania	2.56	1.34	1.36	1.41	1.08	1.66	1.22	47.66

Source: [5], own calculations

In 2017, Italy stood at the top of the EU tobacco producers' ranking, with 48.47 thousand tons. In this ranking was followed by Poland (32.49 thousand tons) and Spain,

29.68 thousand tons (Fig. 2).

Tobacco production below 10.00 thousand tons in 2017 was recorded in the following countries: Croatia (9.41 thousand tons); France (7.90 thousand tonnes); Hungary (7.56 thousand tons); Romania (1.22 thousand tons) and Portugal with 0.12 thousand tons (Fig. 2).

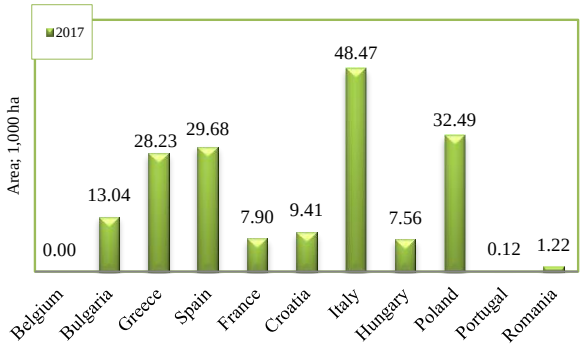


Fig. 2. Tobacco production in U.E. in 2017 (thousand tons)
Source: [5]

According to FAOSTAT data, in 2017, Europe achieved 3.4% of the world's raw tobacco production, ranked fourth, after Asia (62.8%); America (22.8%) and Africa (11.0%). In the top 10 raw world tobacco producers we do not find countries in the European Union. This top in 2017 was made up of: China (2,391,000 tons); Brazil (880,881 tons); India (799,960 tons); United States of America (322,120 tons); Zimbabwe (181,643 tons); Indonesia (152,319 tons); Zambia (131,509 tons); Pakistan (117,750 tons); Argentina (117,154 tons) and United Republic of Tanzania (104,471 tons) [6].

Table 4 shows the average production per hectare of tobacco in the period 2014-2017 for the European Union. The dynamics of the data presented in this table highlights that the average production per hectare for tobacco varied from year to year and from country to country. Spain, in 2017, ranked first in terms of average crop yield per hectare for tobacco growing of 3.39 tons / ha. For Spain, in 2017, the average production per hectare for tobacco crops increased by 3.66% compared to 2015. Yields per hectare over 2.5 tons in 2017 was also obtained in France (2.74 tons / ha) and Poland (2.52 tons / ha). In France, in 2017, the yields per hectare for tobacco crops have increased with 23.42% to 2014. For Poland: average yield per hectare increased by 24.13% in 2017 compared to 2015. In the rest of the analyzed countries were recorded in 2017, average yields per hectare for tobacco culture below 2.5 tons.

Table 4. Dynamics of average production per hectare of tobacco in the E.U. in 2014-2017 (Tons / ha)

Specification	2014	2015	2016	2017
Bulgaria	1.73	1.76	1.53	1.69
Greece	1.58	1.58	1.64	1.66
Spain	-	3.27	3.27	3.39
France	2.22	-	2.59	2.74
Croatia	1.80	2.10	2.00	-
Hungary	1.96	1.68	1.78	1.90
Poland	-	2.03	2.53	2.52
Portugal	2.24	2.26	1.17	2.40
Romania	1.64	1.45	1.79	1.52

Source: [5]

The price of unprocessed tobacco recorded fluctuations in 2011-2016, as evidenced by the data presented in Table 5. In 2016, the highest price for unprocessed tobacco was recorded in Greece (371 euro/100 kg). In Greece, in 2016, the price of unprocessed tobacco increased by 132.05% compared to 2011. High prices of over 200 euro/100 kg for unprocessed tobacco in 2016 were reported in the following countries: France (283.20 euro / 100 kg); Spain (218.64 euro/100 kg) and Poland (207.53 euro/100 kg).

Table 5. Price dynamics for unprocessed tobacco in the main producing countries of the European Union, 2011-2016 (euro / 100 kg)

Specification	2011	2012	2013	2014	2015	2016	2016/2011 %
Belgium	155.16	155.35	160.78	168.82	177.26	180.81	116.53
Bulgaria	176.98	203.36	187.59	190.68	201.14	149.07	84.23
Greece	159.88	340.27	389.09	353	314.00	371.00	232.05
Spain	187.64	185.60	207.13	214.42	214.14	218.64	116.52
France	249.73	256.27	313.63	313.6	313.60	283.20	113.40
Croatia	116.95	110.09	112.73	115.31	111.40	116.76	99.84
Poland	168.15	160.49	160.08	172.77	189.68	207.53	123.42

Source: [5], own calculations

Prices below 200 euro/100 kg for unprocessed tobacco in 2016 were recorded in: Belgium (180.81euro / 100 kg); Bulgaria (149.07 euro/100 kg) and Croatia (116.76 euro/100 kg). In Belgium, the price of tobacco increased by 16.53% in 2016 compared to 2011. In Bulgaria and Croatia there were decreases in prices for unprocessed tobacco in 2016 compared to 2011, by 15.77% and 0.16%, respectively. The drop in the price recorded in Croatia in 2016 compared to 2011 is insignificant.

In an analysis made for 15 countries worldwide, in 2012, the Czech Republic ranked first in tobacco consumption, for people over 15 years, with 2,328 g, followed by South Korea and Germany. In the last few places, the United Kingdom ranked 970 grams and Norway with 994 grams (Fig. 3).

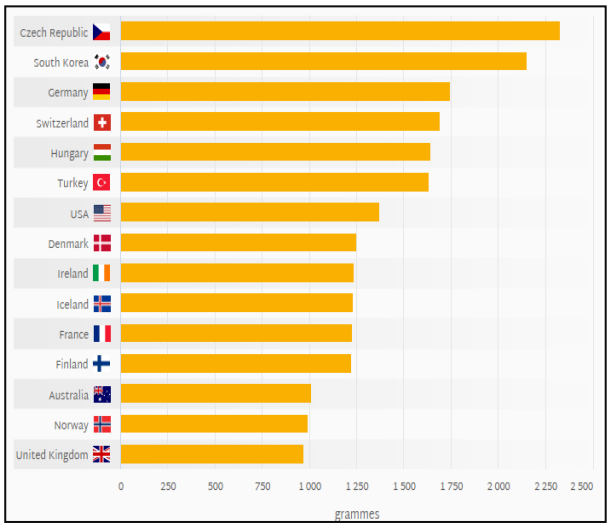


Fig. 3 Tobacco consumption per capita (15+ years old)
Source: [7]

Table 6 shows the value of gross production of unprocessed tobacco in the European Union in the period 2012-2016. The production value recorded fluctuations from year to year.

Table 6. Gross Production Value in E.U., in the period 2012-2016 (current million US$)

Specification	Year	Value
Tobacco, unprocessed	2012	709.79
	2013	789.06
	2014	762.75
	2015	584.31
	2016	561.77

Source: [6]

The highest gross production for unprocessed tobacco was 789.06 current US $ million (2013), and the lowest value was recorded in 2016 (561.77 current US $ million). In 2016, the gross production for unprocessed tobacco declined by 20.86% over 2012. This decline can be attributed to the diminishing of the raw tobacco production.

Quantitative unmanufactured tobacco imports of the European Union varied between 2011 and 2016 (see Figure 4). The most significant quantitative imports were recorded in 2012 (912,168 tonnes) and the lowest were reported in 2016 (837,628 tonnes). From the statistical data on unprocessed tobacco imports of the European Union, it was found that they diminished in 2016 by 5.9% compared to 2011.

Concerning the value of European Union imports for unprocessed tobacco in 2016, it was $ 3,966,182, while the value of imports at the world level was $ 11,712,314.

In 2016, the world's largest importers of unprocessed tobacco and tobacco refuse were: China ($ 1,133,681); Russian Federation ($ 921,370) and Germany ($ 908,825) [8].

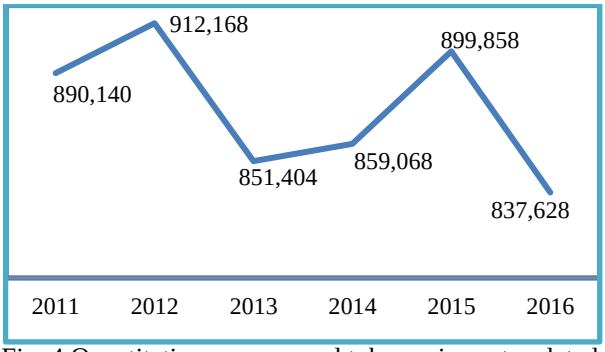


Fig. 4 Quantitative unprocessed tobacco imports related to the European Union in 2011-2016 (tons)
Source: [8]

At European Union level, unmanufactured tobacco exports from 2011 to 2016 have risen. The most significant quantitative export of unprocessed tobacco was achieved by the European Union in 2016 (524,365 tons). Unprocessed raw tobacco exports of the European Union increased by 34.18% in 2016 compared to 2011, when the lowest quantitative exports were achieved.

In the European Union, in 2016, the value of exports for unprocessed tobacco was $ 2,738,902.
Between 2011 and 2016, the trade balance for unprocessed tobacco in the European Union was deficient.
Worldwide, the value of exports for unprocessed tobacco and for tobacco refuse was $ 11,360,187.
In 2016, the world's most representative exporters of unprocessed tobacco and tobacco refuse were: Brazil ($ 2,054,089); USA ($ 1,141,935) and Zimbabwe ($ 887,042) [8].

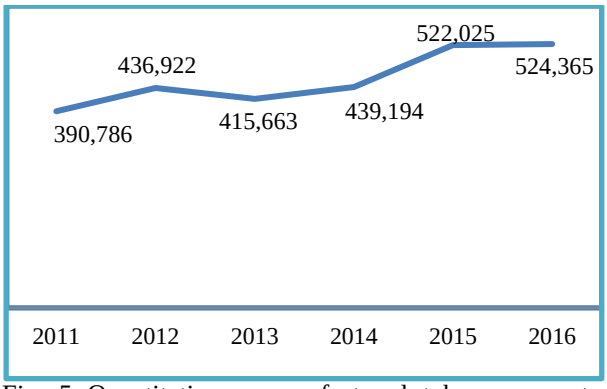


Fig. 5 Quantitative unmanufactured tobacco exports made by the European Union in 2011-2016 (tons)
Source: [8]

It should be remembered that taxation is the most significant intervention to reduce tobacco consumption, especially among young people [14].
There is now evidence to show that tobacco taxation contributes directly and effectively to improving public health, especially by preventing smoking among smokers, but at the same time it supports the reduction of tobacco consumption among smokers [12].

Moral reflection on smoking

People are born without the cigarette in the mouth (which does not exclude smoking predisposition depending on the ascendancy), people could live without it, the non-smokers show it - so smoking won't be from the start a must and fit into the basic needs. However, smoker or not, man, by his nature, remains subject to conditions which, sooner or later, involve critical meetings such as those with physical and psychological pain (particularly moral) and death. Each person, beyond the common attributes of the species, remains an individual equation with countless variables and unknowns.
Starting from the premises listed above, we formulate the question *is it, morally, condemnably smoking?* To which we envisage the drafting of a firmly affirmative argument in a significant case, namely a vulnerable social category, exposed before the discernment is formed among its members: children, pubescent, adolescents.
Condemnation of smoking, even from a moral point of view (by appeal to consequences), is well grounded by exposing scientific medical data demonstrating the harmful effect on active and passive smokers, and these data were previously synthetically exposed within this paper [13].
In their light, we can conclude that any smoker, who knows the above, accepts that, by smoking, he has opted for a slow suicide. Is suicide morally condemnable? At laic level and at least for the three centuries in Europe, as far as we know, it is not (although, according to the death smoking statistics, it is socially allowed a…damaging, even lethal practice on a medium and long term), still there are arguments from the religious morality (Christian, at least). Even so, it is known that, at the origins of tobacco introduction in Europe, even from a laic point of view, the attitude towards smoking was not globally tolerant - however, gradually, the negative effects of smoking were shadowed by the gains of those who acted on the tobacco market: the vice was legalized.
As in any authentic moral issue, however, not all aspects can be legally regulated, leaving interpretations and loopholes for the development of the tobacco industry (and the direct profit of a small number of investors comparable to the number of annual deaths directly associated with smoking). The vulnerable category with predilection (still not the only one, so are ill/ invalid people with a restrained capacity of movement/decision), immature to be able to see the self-destructive option of the smoker, is made up of children, pubescents and teenagers. I consider them (at least potentially) victims, whether they opt early, unfledged and highly influential, for smoking, whether they are passive smokers,

victims of "veteran" smokers (drug addicts) who, deliberately or not, expose many of them from infancy even from the family environment. The Tobacco Atlas, based on Global Youth Tobacco Survey (where 108 countries completed at least two surveys at some point through 1999-2016), shows that "Globally, the estimated numbers of boys and girls 13–15 years old who smoke cigarettes or use smokeless tobacco products are approximately 25 million and 13 million, respectively" [15].

But as not all children smokers fall into the 13-15 year age category, their number is higher.

The effects of smoking on this vulnerable category can be argument to morally condemn smoking arguing by:

(i)Transforming children into *passive smokers* exposed to physical suffering at least in smokers' families where no protective measures are taken; children, according to their age peculiarities, have no strong and deliberate defenses, are dominantly chained to the adult's will, like the adult smoker is chained by the drug. There are no regulations on smoking in the private area, and in the case of the family, the child shares this private space with the adult; of course, it is possible to resort in certain critical and known cases to institutions for the protection of the child (getting to trials in tribunals), but the path is sinuous and the genuine protection of the child is really delicate;

(ii)Transforming children into smokers: education and human becoming are made by the power of the example - the examples are fixed in the mental / emotional level, from where the attitudes and the behavior of the human individual work. The repeated contact with smoking-friendly examples can be done either directly or mediated, deliberately or latently: parents, the same age group, mass media and other factors (among which the category of smokers). The psychology of ages is exploited on the tobacco market to create new consumers, although generic the struggle between adults and children means from the beginning uneven forces and control, the domination of the child: from the spirit of imitation of adults, from the desire to be fashionable, from rebellious, to fill (apparently) an emotional gap, to look mature, many children, pre-adolescents and adolescents succumb to smoking. For the category concerned, subject to greater and more complex pressures than the degree of discernment, the statement "The decision is mine!" promoted through anti-smoking programs and campaigns, is profoundly hypocritical.

Prevention is promoted in parallel with the drug and both are equally legal. Are they equally moral? Is the promotion of drug-addiction, of any kind, moral? Personally, we answer "no" because it fundamentally undermines the (limited) degrees of human freedom, but ... let's let the only ones free of vices to "throw the stone" first in the smokers.

CONCLUSIONS

During the period 2011-2017, the tobacco market at EU level was highlighted by the following:

-Tobacco cultivated surfaces have fluctuations in the main cultivating countries;

- in 2017, the largest area of tobacco was cultivated in Greece - 16.99 thousand ha;

- the smallest tobacco area in 2017 was reported in Belgium and Portugal - 0.05 thousand ha;

- Bulgaria has been highlighted by the largest number of tobacco growers in the European Union;

-manufactured tobacco products were determined, on the one hand, by the areas cultivated with tobacco and, on the other hand, by the average production per hectare recorded for tobacco;

- the most significant productions in 2017, were made by Italy - 48.47 thousand tons;

- Spain has recorded the highest average production per hectare for tobacco. In 2017, it recorded a record average production of 3.39 tons / ha;

- Greece, in 2016, was noted by the highest price for unprocessed tobacco, namely 371 euro / 100 kg;

- The Czech Republic, in 2012, ranked first in the world, from 15 analyzed countries, in

terms of tobacco consumption, in people over 15 years old;
- In 2013, the highest value for gross raw tobacco production, of 789.06 current million US$;
- starting from 2011 to 2016, the quantitative imports of unprocessed tobacco have outpaced the quantitative exports;
- Germany, in 2016, ranked third among the top global importers.

Nicotiana tabacum has a wide potential for use. It is valued / exploitable both in the medical industry for declared curative purposes, as well as in ambitious medical research (e.g. genetic manipulation for anti-cancer role, the design of an anti-decay spray - see Popescu, O., Achim, A., Popescu, AL, 2012, p.20 [11], but also as an insecticide, in the chemical industry, food industry and is a melliferous plant. Still, it useS for smoking, even apparently or in short term, gives satisfaction to consumers, also in multiple physical ways as nicotine is addictive. The World Health Organization has established that smoking kills "up to half of its users", "over 7 million people each year"(6 million as result of direct tobacco use and around 890,000 as result second-hand smoke) [16]. Prevention is promoted in parallel with the drug, both are legal ... and the practice in itself is difficult to be morally evaluated. The most vulnerable category is made up of children, pubes and adolescents; globally estimation indicates that children "13–15 years old who smoke cigarettes or use smokeless tobacco products are approximately 25 million and 13 million, respectively" [15].

We would call *immoral* smoking in any context where children (and any other human) are condemned to secondhand smoke and in any way it corrupts children to become, from childhood, smokers.

REFERENCES

[1]Bitton, A., Neuman, M.D., Glantz, S.A., 2002, Tobacco Industry Attempts to Subvert European Union Tobacco Advertising Legislation, https://cloudfront.escholarship.org/dist/prd/content/qt3r1334mz/qt3r1334mz.pdf?t=lnqsni&v=lg, Accessed on February 10, 2019.

[2]Boessen, S., Maarse, H., 2008, BMC Health Services Research, The impact of the treaty basis on health policy legislation in the European Union: a case study on the tobacco advertising directive, https://bmchealthservres.biomedcentral.com/articles/1.1186/1472-6963-8-77, Accessed on February 12, 2019.

[3]European Commission / Agriculture and rural development, https://ec.europa.eu/agriculture/sites/agriculture/files/tobacco/statistics/production-statistics_ en.pdf, Accessed on February 10, 2019.

[4]European Commission/ Agriculture and rural development https://ec.europa.eu/agriculture/tobacco_ro, Accessed on February 10, 2019.

[5] Eurostat, https://ec.europa.eu/eurostat/data /database, Accessed on February 8, 2019.

[6] Faostat http://www.fao.org/faostat/en/#data/QC, Accessed on February 23, 2019.

[7] Helgi Library, https://www.helgilibrary.com/indicators/tobacco-consumption-per-capita-15-years-old/, Accessed on February 10, 2019.

[8] International Trade Centre, http://www.intracen.org/itc/market-info-tools/ trade-statistics/, Accessed on February 8, 2019.

[9] International Tobacco, https://www.international-tobacco.co.uk /reglementarea-produselor-din-tutun, Accessed on February 10, 2019.

[10] Leașu, T., Nedelcu, L., Pantea, I., 2008, Historical points of smoking habits, XXXIXth National Meeting of the History of Medicine 12-15 June 2008, Brasov, p. 36-37, (Repere istorice ale obiceiului fumatului, A XXXIXa Reuniune Nationala de Istoria Medicinei, 12-15 iunie 2008, Brasov, p 36-37), http://webbut.unitbv.ro/jmb/JMB%202008%20nr.2%20supliment%20ist%20med/CD/articole%20extenso/ist%20med%20pdf/15%20leasu%20ist%20fumat.pdf, Accessed on February 24, 2019.

[11]Popescu, O., Achim, A., Popescu, AL., 2012, Life in Hexagon of Death: Tobacco, Alcohol, Drugs, AIDS, Pollution, Malnutrition, Bucharest, Fiat Lux Publishing House Second Edition, p. 15-41 (Viața în hexagonul morții: tutunul, alcoolul, drogurile, SIDA, poluarea, malnutriția, București, Fiat Lux, Editia a 2a, p. 15-41).

[12]Pricing Policies and Control of Tobacco in Europe, Policy Recommendations for Tobacco Taxation in the European Union Integrated Research Findings from the PPACTE project, February 2009 – March 2012, LSHTM Research Online http://researchonline.lshtm.ac.uk/1249628/1 /ppacte_policy_recommendations_and_integrated_report.pdf, Accessed on February 25, 2019.

[13]Roman, F.T., 2010, The idols of our time Bucharest, Evanghelismos Publishing House, p.395-414 (Idolii vremurilor noastre, București, Evanghelismos, p.395-414).

[14]Smoke Free Partnership, TOBTAXY (Making Tobacco Tax Trendy Project), Tobacco taxation and illicit trade, (Impozitarea tutunului şi comerţul illicit), https://smokefreepartnership.eu/our.../140_49b8ac2eaadc1a54ba4e6da66b69cbdc, Accessed on February 10, 2019.
[15] The Tobacco Atlas, https://tobaccoatlas.org/topic/youth/, Accessed on February 26, 2019.
[16] World Health Organisation, Tobacco, https://www.who.int/news-room/fact-sheets/detail/tobacco, Accessed on February 28, 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

INDIVIDUAL SECTOR OF AGRICULTURE IN MOLDOVA: A PATH TO RURAL DEVELOPMENT?

Liliana CIMPOIES, Elena SEMIONOVA

State Agrarian University of Moldova, 42 Mircesti St, Chisinau, Moldova, Email: l.cimpoies@uasm.md

Corresponding author: l.cimpoies@uasm.md

Abstract

The individual farms are the backbone of rural areas and account more than 80% of all farms. Family farms are quite diverse: from subsistence and semi-subsistence to fully market-oriented farms, often using technologies advances. Presently, the agricultural sector of Moldova is divided into two categories: a large number of small individual farms and some large corporate farms. The investigation is analysing the level of development of individual farms in Moldova and its possible contribution to the development of rural areas. The study is based on individual farms survey. The data was collected as part of the institutional research project 15.817.05.31A "Sustainable Rural Development in the Republic of Moldova in the Context of European Integration". It includes data analysis of 938 individual farms from 9 different districts. The survey includes different parts related to: the social-demographic characteristics, infrastructure and financial information. The obtained results shows changes in the social demographic aspects, mostly generated by the migration process and the "modest" incomes characteristic for rural areas. The individual farms surveyed present the average technical efficiency which is mostly influenced by the level of income and the small size of agricultural area, while the level of expenses has little influence.

Key words**:** *agriculture, individual sector, rural areas, rural development, survey analysis*

INTRODUCTION

The individual farms are the backbone of rural areas and account more than 80% of all farms. The key element is the family and family members who are "employed" within the farm and administrates it. Family farms are quite diverse: from subsistence and semi-subsistence to fully market-oriented farms, often using advanced technology. According to FAO data there are over 500 million family farms in the world and they produce over 70% of total worldwide food supply [5].

In developing the term of "family farms", FAO conducted a literature review on the topic and identified the main features of family farms. Several features that presents family farms are: the freedom in choosing employment, the transfer of property through generations and affinity with kinship or marriage [5]

Individual farms are of different types and sizes, with full and part-time work, with paid or unpaid activities. Some specialize in commercial business operations, while others mainly produce products to meet domestic food needs, so-called semi-subsistence farms [4].

In the context of the International Year of Family Farming 2014, the United Nations proposed general principles that define family agriculture (which includes all family-based farming activities): "Family farms includes all types of family farming activities and covers several areas of rural development. Family farming is a way of organizing agricultural, forestry, fish, grazing and aquaculture production, carried out and managed by the family and based primarily on the work of family members, both women and men. The family and the farm are connected, they develop and integrate economic, environmental, social and cultural functions. These principles are translated into strict definitions that can be used for statistical and political purposes in all regions and for a long time the family farm is an agricultural holding that is managed by a family and in which agricultural labour is largely represented by this household" [5]

Family farms are an integral part of European agriculture - the basis of a sustainable and market-oriented European agricultural sector. Across E.U. countries the number of farms is decreasing while the average farm size is increasing. Despite this fact, in the E. U., family farms persist as an organizational model in the agricultural activity [4].

In Moldova, the agricultural sector of the Republic of Moldova includes two main categories: many small individual farms and some large corporate farms.

The individual sector is separated between many small households and individual farms. They are typical family farms, and the main difference is in their size and commercial orientation. Households are usually smaller than family farms in size and usually located near the house. Also an important feature for individual farms is that they ensure the food supply for their family, they mostly have the characteristics of subsistence farming, but these groups often overlap. The activity of individual farms relies on the own members labour supply. By contrary, the corporate sector includes more large-scale farms, which during the reforms in 90s, replaced the large collective and governmental farms. This sector is represented by the organizational form of private companies owned by one or more shareholders. These farms operate a large area of own or rented land, hire labour force and focus on specialization of production.

This paper aims to appreciate the progress in the development of individual sector of agriculture in Moldova and its possible positive outcome for the development of rural areas.

MATERIALS AND METHODS

The study is based on individual farms survey. The data was collected as part of the scientific institutional project 15.817.05.31A "Sustainable Rural Development in the Republic of Moldova in the Context of European Integration". It consists on a data set of over 900 individual farms across 9 different districts that participated in this survey: Ialoveni, Causeni, Briceni, Calarasi, Orhei, Telenesti, Stefan Voda, Cahul, Ocnita. The survey includes different parts related to: the social-demographic characteristics (age, gender, family composition, education, primary and secondary employment, etc.); infrastructure (availability of water supply, sewage system, heating, household appliances, etc.); and financial information (the size and structure of farms, the level of costs and incomes, the yield of individual crops, as well as information on lending and subsidies).

RESULTS AND DISCUSSIONS

The transformation processes in the 90s determined many changes for Moldovan agricultural sector. Among those changes is related to agricultural land use. According to the General Agricultural Census, there are 2,498.3 thousand hectares of agricultural land, from which arable land accounts 1,812.7 thousand hectares while orchards and vineyards - 298.8 thousand hectares.

The average size of utilized agricultural land per farm is 2.29 hectares. From total area of utilizedagricultural land (1.94 million hectares), corporate farms (0.4% of all farms), benefit from 61% of the utilized area with an average of 391.27 hectares per farm, while individual farms (99.6% of all farms) benefit from 39% from utilized agricultural area, with an average value of 0.89 ha per farm.

Almost 71% of all farms (640,438 units), which operate 10% of the utilized area of farmland (196,546.81 hectares) benefit from less than 1 hectare of land. In fact, the Moldova's agricultural sector is characterized by the coexistence of many small individual farms with few corporate farms (0.01%). Less than 0.3% of all agricultural producers (2,412 units), have an average farm size of more than 100 hectares, operate 63.4% of the total utilized area (1,229,549.02 hectares). From them 88.3% are corporate farms.

According to NBS data, almost 70% of corporate farms fall into the category "100-500 hectares" (343 farms) or "500 hectares or more" (1,339 farms), utilizing over 97% of all agricultural area (1,191,019.25 hectares).

Over 98% of individual sector (884,326 farms) are concentrated by size of land into the category of up to 5 hectares, utilizing over 76% of all agricultural land belonging to farmers (570,535.83 hectares).

An individual farm in Moldova benefits in average from 0.4 hectares of land, while in the surveyed sample only from 0.33 hectares. The average size of farmer plots is 1.62 ha, with 0.41 ha less than the value presented in the sample (2.03 hectares). The largest area of the individual farms is utilized for crops (about half of the area), vineyards (20%), sunflower (11%), fruits (5%) and melons and gourds (2%) (Figure 1).

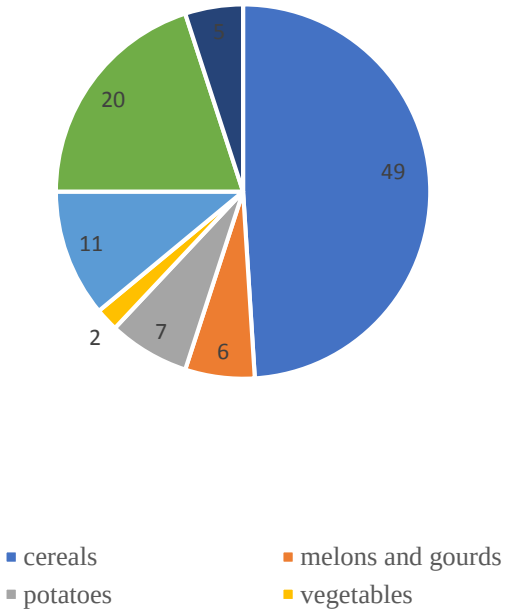


Fig. 1. Structure of production of family farms according to the main crops, %
Source: own calculation

According to General Agricultural Census [8], more than 97% of all farms (877,290 farms) cultivate fully owned land, which accounts for 57% of all land (1,285,137.85 ha). The share of fully owned land varies significantly depending on the legal status of the farm: 34.1% (433,675.85 hectares) of land is concentrated in corporate farms while 87.7% (851,462 hectares) is owned by individual farms. Only 2,685 of farms or 0.3% of utilized are managed by tenants, which represent 25.5% of the total (571,503.71 ha). Corporate farms utilizes not only fully owned land but also leased land (43%). Meanwhile, individual farms utilize mainly fully owned land (only 3% of their total area is leased).

An important aspect for development represent the rural areas. Moldova's rural area is characterized by the existence of 1,614 villages and a population of 2.42 million people (57.5% from total population). Nowadays a decline in rural areas population is persisting. Moldova faces a serious demographic crisis, which lead to the disappearance of four villages and 10 thousand inhabitants.

From the processed survey the types and characteristics of families in rural areas has changed (Figure 2). The main change is regarding the family size. A family with three or four children used to be common, now the share of these types of families does not reach even 10%.

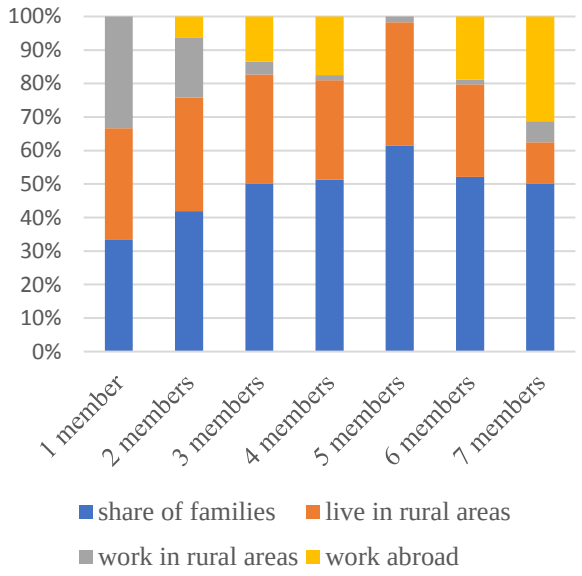


Fig. 2. Types and characteristics of families in rural areas
Source: own calculation

The vast majority of families consist of two or three people. More common are considered families with two family members (24%). The share of such families reaches a critical point about 70%. While the share of families consisting of seven people, reaches only - 0.90%. Financial situation, related to low incomes in rural areas is one of the principal reasons that led to the deterioration of the birth rate. According to demographers, every

fifth family is faced with the problem of maintaining their own children, while the government support nowadays is low. Although the amount of lump-sum allowance at birth has increased 10 times over the past 15 years, it is not able to cover all necessary expenses [6, 7, 11].

Migration is a serious problem that affect mostly rural areas. Typically larger families (3-4 members) have the highest rate of migration, 26 and 32 percent. There is no outflow of people abroad only in families with 1 person or retired members. For them a high level of job security or over 50 percent is characteristic.

Ageing population is a problem for Moldovan rural areas. Another serious contrast in rural areas is related to the average age of farm managers. Most of farm managers (75%) are aged between 41 and 70 y.o., while young farmers represent only 5%. Thus, the opinion that the largest number of young people are trying to open their own business is not confirmed, since the main group of entrepreneurs are people whose age is more than 30 years. This phenomenon indicates an intensive urbanization of a large part of the country's "younger part", as well as a significant migration flow [10, 12].

Farm management is concentrated in age categories between 30 to 50 years old (36), 50 to 60 years old (29%) and over 60 years old (34%). Many individual farms are headed by people of pre-retirement and retirement ages from 50 to 70 years (52%). The gender gap in farm administration is also large. Mostly men are farm managers (75%), while the farms run by females only reach 25%.

Education is an important aspect that can affect farms level of development. Some empirical studies have shown that wages increase followed by a growth in the education level [6, 7]. In our survey we considered farm managers level of education (Figure 3). From the results, less than 20% of all farm owners received incomplete secondary education. Incomplete higher education is less than 9%, while higher education - 10%. The largest share (36%) is represented by farm owners that have a secondary general education. Second position in the chart is referred to farmers with partially secondary education.

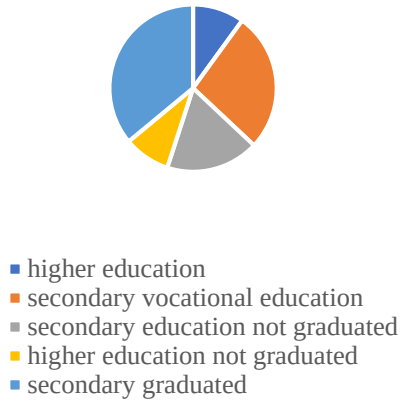


Fig. 3. The level of education of farm manager
Source: own calculation

Agriculture is still considered the main source of income for over 60% of rural inhabitants. The farms survey data reveals that wages represent the major source of income for rural population. The incomes received from agricultural activities have a modest share of 17.5%, while remittances from abroad represent 23.4%.

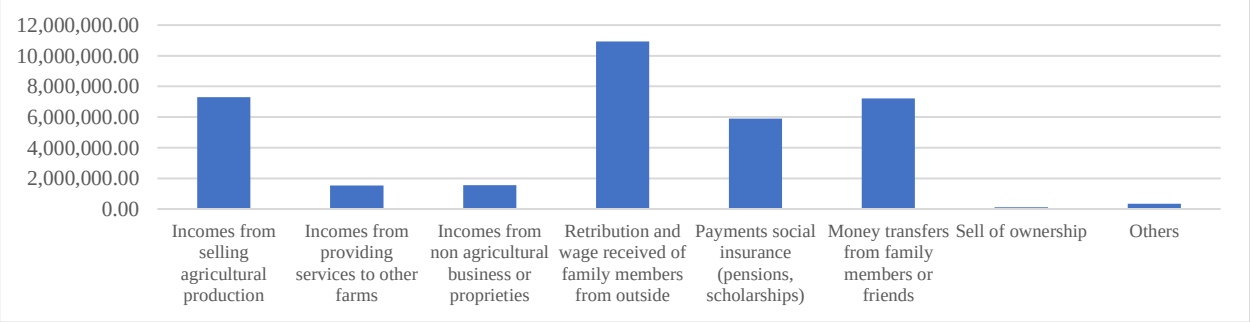


Fig. 4. The main source of incomes in rural areas
Source: own calculation

Some studies affirm that the money received from remittances, or around 10% of them tend to be invested in agricultural activities. The last years downturn in the agricultural sector caused a decrease in offered jobs, thus most of the income of in rural areas are related to non-farm activities.

Thus an expansion of population incomes sources in rural areas and development of non-farm activities is the key element to rural development [1, 2].

The non-agricultural sector includes all other activities in the rural space, except for activities in agriculture, fishing and hunting. Non-agricultural activities may include work for farm family members in a city or in another country.

The survey data analysis shows that 37% of managers receive income from rural activities, which is tantamount to non-agricultural employment. Non-agricultural employment is the main source of income and represents 36%, which is 4% more than the farms activity indicator.

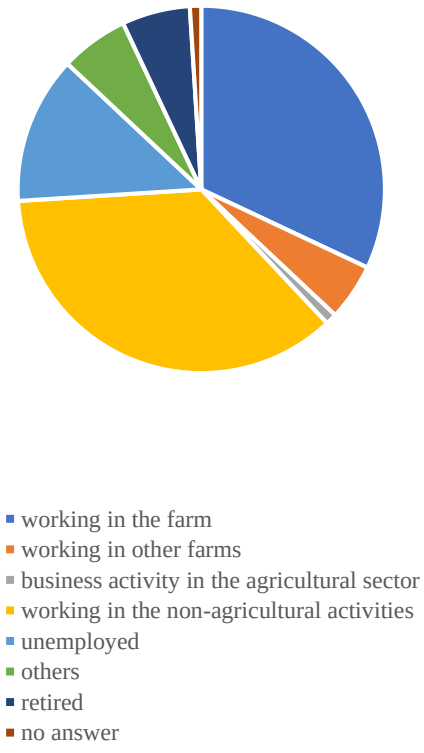


Fig. 5. Non-agricutural activities in rural areas
Source: own calculation

Farm efficiency is a key element for achieving both agricultural and rural development. The obtained competitive results of farms are generated by an efficient use of production factors.

According to Ratinger [9], efficiency consists of three different types: technical, allocative and social. Farell [3] presented the method used to appreciate the economic efficiency which consists of two main parts: allocative and technical efficiency.

Technical efficiency obtain scores from 0 to 1. Technical efficiency represents farms capacity to generate a maximum amount of output from a set of inputs.

Technical efficiency will help us to estimate the farm development level. From the scores obtained on the surveyed sample of 723 farms, technical efficiency presents an average a score of 0.538.

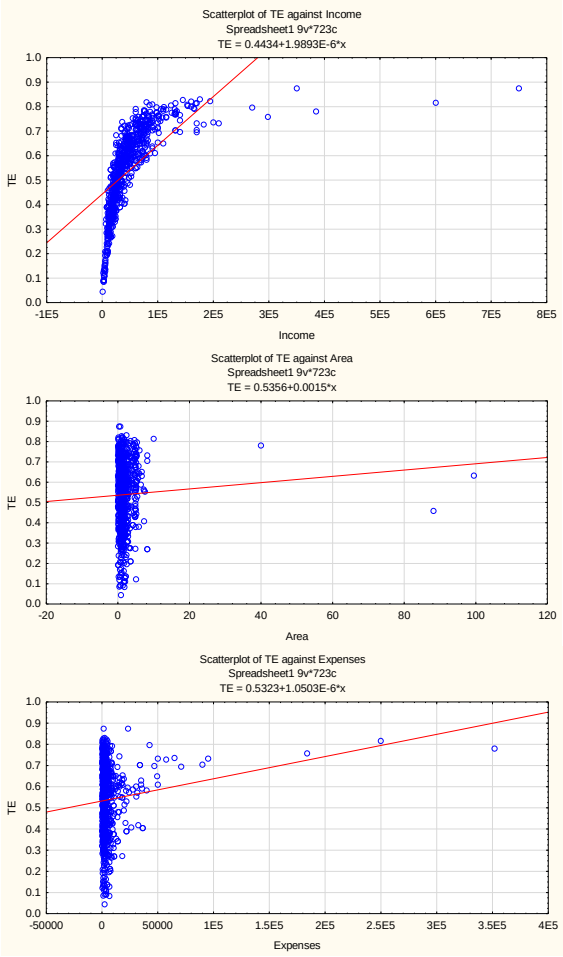


Fig. 6. The interdependence between farm technical efficiency and income, agricultural area and expenditures.
Source: own calculation

The obtained values have a range between 0.044 and 0.874. The increase of farm

technical efficiency could be a key not only to farm performance but also to a greater and sustained growth in the agricultural sector, followed by an increase of income for individual farmers and development of rural areas.

From previous research [1], multiple regression analysis shows a strong correlation between the farm technical efficiency and factors as: income, agricultural area and expenditures. A stronger impact on technical efficiency has the farm income (0.81).

The results of regression analysis separate for the three factors of influence (Figure 6) reveals a medium strong correlation between technical efficiency and incomes(0.6) and area (0.4). In the same time expenditures level tend to show week impact on farm technical efficiency (0.12).

CONCLUSIONS

The agricultural sector of Moldova could be described by the coexistence of many small individual farms and some large corporate holdings. The average size of the utilized land of farms in the surveyed sample is 0.33 hectares. Over 50% of the utilized agricultural area is cultivated under crops. Family structure in rural areas had changed substantially overtime, a family with 2-3 members having the largest share in the survey.

Farm managers hold a certain level of education. Most farm managers have higher or secondary vocational education. Agriculture still represents a principal source of income for rural population, while non-agricultural activities have a small share.

According to the results of the surveyed sample of 723 farms, technical efficiency presents an average a score of 0.538. The obtained values have a range between 0.044 and 0.874. The results of regression analysis presents a medium strong correlation between technical efficiency and incomes (0.6) and area (0.4). The increase of farm technical efficiency could lead not only to farm performance but also to higher growth in the agricultural sector, contributing to the increase of income for individual farmers and sustained development of rural areas.

ACKNOWLEDGEMENTS

This research was carried within the Institutional Project 15.817.05.31A financed by the Academy of Sciences of Moldova.

REFERENCES

[1]Cimpoies, L., Semionova, E. 2017, The individual sector of agriculture in Moldova and its contribution to the development of rural areas, Rural Development 2017: Bioeconomy challenges, 955-959.

[2]Cimpoies, L., Semionova, E., 2018, Farms typoligies and their impact on the development of rural areas in Moldova, Conference Proceedings „Agriculture for Life, Life for Agriculture" 1(1), 190-195.

[3]Farrell, M. J., 1957, The measurement of productive efficiency, Journal of the Royal Statistical Society, 120, 253-290.

[4]Hall, R. E., Jones, Ch. I., 1998, Why do some countries produce so much more output per worker than others? NBER Working Paper Series 6564.

[5]Food and Agriculture Organization (FAO) of United Nations, http://www.fao.org/family-farming-2014/home/what-is-family-farming/en/, Accessed on 9.02.2018

[6]National Bureau of Statistics, 2016, Aspects of the population standard of living. National Bureau of Statistics of the Republic of Moldova.

[7]National Bureau of Statistics, 2016, Statistical Yearbook of the Republic of Moldova.

[8]National Bureau of Statistics, 2011, General Agricultural Census.

[9]Ratinger, T., 2001, Methodology for assessing determinants of competitiveness of Czech, Hungarian and Polish farms. IDARA.

[10]Sarbu, O., Cimpoies, L., 2018, Poverty reduction in rural areas through agricultural development: evidence from Moldova. Journal "Agriculture and Forestry", Podgorica, 64(1), 81-88.

[11]Sarbu, O., Cimpoies, L., 2018, The economic impact of emigrant's income in the Republic of Moldova. Scientific Papers Series „Management, economic engineering in agriculture and rural development" , Vol.18 (2), 383-390.

[12]Semionova, E., 2015, The influence of the family farms on the socio-economic development of rural areas of the Republic of Moldova. Scientific symposium of young researchers XIII 1, 187-190.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

DEMOGRAPHIC ANALYSIS OF SOUTH MUNTENIA REGION

Cătălina Nicoleta COMAN, Valentina TUDOR

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Emails: catalina.coman92@yahoo.com, valentina_tudor@yahoo.com

Corresponding author: catalina.coman92@yahoo.com

Abstract

This paper aims to carry out a study research on the structure of the population in the South-Muntenia development region through which analyzed and interpreted statistical data are combined with theoretical aspects and lead to a detailed analysis of the regional information on the structure of the population in the South Muntenia region. The population of South-Muntenia development region, which includes the counties Argeş, Călăraşi, Dâmboviţa, Giurgiu, Ialomiţa, Prahova and Teleorman, equals 2.984.992 persons in 2017 and represents over 15% of the total population of Romania.

Key words**:** *South-Muntenia region, population, demographic survey, migration, labor force*

INTRODUCTION

Demographic studies, especially the information that these studies develop, are of great importance because they directly indicate the evolution of natural growth, consequently the demographic changes taking place within a community. The greatest significance of these studies derives from the direct way in which they influence social policies by marking on education, social protection, transport, health, tourism or labor market systems. Despite that based on the number of inhabitants Romania is on the top in the EU, it is facing a downward population trend due to the aging of the population, the excessive migration of young people to other countries, the relocation of their homes, and especially because the birth rate does not exceed the mortality rate, so the natural replacement of the population can not be achieved. In order to prevent the direct way in which demographic resources influence the daily life of the population, especially the way in which the evolution of labour force, labour resources and economy is marked, we need to know very well how the demographic phenomenon evolves, both rural and urban. [1] [8] [9].

MATERIALS AND METHODS

Based on the accumulated theoretical information and statistical data provided by the National Institute of Statistics (ins.ro), by Eurostat (ec.europa.eu/eurostat), the statistical organism at the European Commission level and the FAO (fao .org), the Food and Agriculture Organization, it was conducted a data interpretation, research and analysis study in order to evaluate the South-Muntenia Region's information on population structure.

RESULTS AND DISCUSSIONS

The South-Muntenia Development Region is situated, as its name says, in the southern part of Romania, on the territory of the historical region of Muntenia and it is composed of the counties of Argeş, Prahova, Dâmboviţa, Teleorman, Giurgiu, Ialomiţa and Călăraşi.
The region natural landscape is disposed in ladders, in the Southern part being found the lowest altitudes which are rising to the North up to the altitude of 2,500 meters. Plain is predominant occupying over 70% of the area of the region, which should support the attraction of the population in this region because favorise the development of more occupations [9] [10]**.**

With an area of approximately 34,452 km^2, the South-Muntenia region occupies almost 14.5% of the total area of the country, and within it the county with the largest area is Arges County, and the one with the smallest surface is Giurgiu County. As far as the population is concerned, a little over 15% of Romania's total population lives in this region, and judging by this criterion, the leading county in this development region is Prahova, and the last one is Ialomita County. In the counties that forms this development region, the population is distributed as follows: almost 20% - Arges County, 9.7% - Calarasi County, over 16.5% - Dâmboviţa County, just over 9% - Giurgiu County, about 9 % - Ialomita County, 24.4% - Prahova County and over 11.5% - Teleorman County [4] [9].
Table 1 presents a series of data regarding the surface and population of the South-Muntenia development region.

Table 1. Overview of the South-Muntenia region's territory and population

	South-Muntenia region	**Argeş County**	**Călăraşi County**	**Dâmboviţa County**	**Giurgiu County**	**Ialomiţa County**	**Prahova County**	**Teleorman County**
Surface (km²)	34,452	6,826	5,087	4,054	3,526	4,452	4,715	5,789
Population	2,965,205	585,730	288,043	496,173	269,279	258,931	725,609	341,440
Population density	86.06	85.8	56.6	122.4	76.4	58.16	153.9	58.9
Urban population (%)	39.46	45.96	36.14	28.20	29.05	44.29	48.65	32.45
Population in rural areas (%)	60.53	54.03	63.85	71.79	70.94	55.70	51.34	67.54
Population by gender urban / rural								
Male	1,458,514	286,092	142,162	245,860	133,740	128,029	353,930	168,701
Female	1,506,691	299,638	145,881	250,313	135,539	130,902	371,679	172,739
Both sexes urban	1,170,112	269,221	104,126	139,963	78,245	114,695	353,040	110,822
Male	559,910	128,347	50,075	66,683	38,090	55,742	168,016	52,957
Female	610,202	140,874	54,051	73,280	40,155	58,953	185,024	57,865
Both sexes rural	1,795,093	316,509	183,917	356,210	191,034	144,236	372,569	230,618
Male	898,604	157,745	92,087	179,177	95,650	72,287	185,914	115,744
Female	896,489	158,764	91,830	177,033	95,384	71,949	186,655	114.874

Source: National Institute of Statistics, TEMPO-Online, accessing and processing data 03.2019.

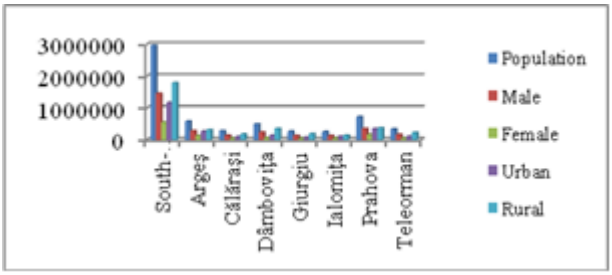


Fig. 1. Distribution of population in the region after the number, sex and area of residence
Source: National Institute of Statistics, Tempo-Online, accessing and processing data 03.2019.

In 2018, on the 34,452 km^2 area of the South Muntenia region, lived 2,965,205 people, disposed in the seven counties that make up the region as it follows: almost a quarter of the total population in Prahova County, with a density equal to 154 persons per km^2, approximately 20% in Argeş county, 16.73% in Dâmboviţa county, over 11% in Teleorman County and under 10% in Călăraşi (9.71%), Giurgiu (9.08%) and Ialomiţa (8.73%).
If the highest density of the population in this region it is found in Prahova County, the lowest density is in Călăraşi County and is equal to about 57 persons per km^2, and on average in the region this indicator is equal to 86 persons per km^2.
Analyzing the data on the residence environment in which people live in the South-Muntenia Region, we can notice that the rural population is larger than the urban population, a trend that is valid in all the counties that compose the region [4] [5] [9].

Table 2 provides information on population trends over the period 2014 -2018 in the distribution of population by age groups.

Table 2. Population, by age group, in the South-Muntenia region

Years	Total number of persons	By age group		
		0-14 years	15-59 years	Peste 60 de years
2014	3,085,723	465,503	1,844,039	776,181
2015	3,061,759	458,726	1,819,626	783,407
2016	3,031,555	451,594	1,788,525	791,436
2017	3,003,349	445,914	1,758,181	799,254
2018	2,965,205	440,394	1,725,207	799,604

Source: National Institute of Statistics, Tempo-Online, accessing and processing data 03.2019.

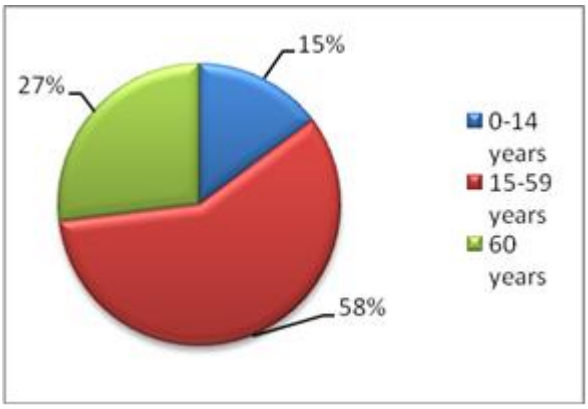


Fig. 2. Distribution of population by age groups South-Muntenia region in 2018
Source: National Institute of Statistics, Tempo-Online, accessing and processing data 03.2019.

Regarding the population of the South-Muntenia Region, following the analysis of the data in Table 2, we can see that a negative trend in the whole region is outlined during the reference period. Every year during the analyzed period the number of inhabitants decreased by about one percentage point, which led to a decrease of the population by just over 4%.

This decrease is due to the fact that between 2014 and 2018 the number of births was lower than the number of deaths, as evidenced by the decrease of the population aged 0-14 by almost 6%, the decrease by 6.4% of the population between the ages of 15 and 59 years and the increase in the number of people aged 60 and over by 3%.

This population aging phenomenon is not only valid in the South-Muntenia Region, because also in all Romania the number of people aged 60 years and over increased by 3% and the population aged 0-14 and 15-59 years declined by 5.5% and respectively by 6.5%.

Also more aging population and negative natural growth are two phenomena present at the level of the entire European Union, phenomena supported by the decrease of the population aged 0-49 years and population growth aged 50 and over [11].

In Romania, recording a negative natural growth and population aging have become two phenomena encountered each passing year, which leads to GDP decline, increase in the pension fund and the social and health insurance and thus the decrease in life expectancy.

For these reasons, many of our country's inhabitants, in the hope of a better life, migrate, most of the time taking their entire family abroad, especially looking for a better paid job [5, 6, 9].

The migration of the population is also important in analyzing the demography of a region. In the region analized, population migration is experiencing a negative trend, since in all years taken into reference (2013-2017), the number of departures was higher than the number of arrivals. Due to the fact that the level of arrivals increased by only slightly over 3% during the analyzed period and the level of departures increased by over 11%, the balance of the internal migration is increasing by almost 130%, which reinforces the negative trend known by the migration of population within the region. This fact is determined by the level of the internal migration balances of the counties of the South-Muntenia region, respectively in Argeş County, almost 60% more people departured than they have settled in 2018 compared to 2013, 278% in Călăraşi County, in Dâmboviţa County with 182%, in Ialomiţa County with 56%, in Prahova County with 233%, and in

Teleorman County with 117%. The only county in the studied region where the number of persons who have settled is higher than the number of people who left, is Giurgiu County, but the percentage of 2% is not representative enough to compensate for the general phenomenon of migration from the rest of the counties, unlike the prior years to the reference period, in which also in Dâmboviţa county there was a positive migratory balance [8] [9].

Table 3. Internal migration movement with change of residence in South-Muntenia Region

	2013	2014	2015	2016	2017
South-Muntenia Region					
Arrivals	45,797	49,151	47,438	51,506	47,010
Departures	49,073	52,296	51,436	56,078	54,517
Internal migration balance	-3,276	-3,145	-3,998	-4,572	-7,507
Argeş County					
Arrivals	9,869	10,112	10,160	10,586	10,041
Departures	10,600	10,831	10,719	11,424	11,205
Internal migration balance	-731	-719	-559	-838	-1,164
Călăraşi County					
Arrivals	4,361	4,589	4,392	5,103	4,396
Departures	4,688	4,969	4,913	5,741	5,632
Internal migration balance	-327	-380	-521	-638	-1,236
Dâmboviţa County					
Arrivals	8,060	8,755	7,987	8,833	7,993
Departures	8,482	8,990	8,464	9,153	8,760
Internal migration balance	-422	-235	-477	-320	-767
Giurgiu County					
Arrivals	3,922	4,533	4,435	4,883	4,185
Departures	3,662	3,773	3,907	4,287	4,091
Internal migration balance	260	760	528	596	94
Ialomiţa County					
Arrivals	4,062	4,297	4,145	4,550	4,076
Departures	4,768	5,069	4,897	5,312	5,180
Internal migration balance	-706	-772	-752	-762	-1,104
Prahova County					
Arrivals	10,101	11,187	10,804	11,514	11,100
Departures	10,446	11,844	11,803	12,621	12,248
Internal migration balance	-345	-657	-999	-1107	-1,148
Teleorman County					
Arrivals	5,422	5,678	5,515	6,037	5,219
Departures	6,427	6,820	6,733	7,540	7,401
Internal migration balance	-1,005	-1,142	-1,218	-1,503	-2,182

Source: National Institute of Statistics, Tempo-Online, accessing and processing data 03.2019.

Regarding the number of persons who settled in the South-Muntenia region in 2017, Prahova County had the highest contribution by 24%, followed by Argeş county by 21%, then by Dâmboviţa County with 17 %, Teleorman County with 11% and the counties Călăraşi, Ialomiţa and Giurgiu had lowest contribution of 9%.

Taking into account the number of persons who migrated, externally or internally in 2017 in the South Muntenia Region, the county from which people migrated the most is Prahova County with 22%, followed by Argeş county by 21%, then by county Dâmboviţa with 16%, Teleorman county with 14%, Călăraşi county with 10%, Ialomiţa county with 9% and Giurgiu county with 8 %.

Compared to the populations' migration trends

in all the development regions in Romania, the migratory flow in South-Muntenia region is an accentuated one and the number of people leaving the region is higher than the number of people who establish their domicile within it.

Table 4.Changes of residence by region during 2007-2017 - rate per 1000 inhabitants

	Year 2007		Year 2010		Year 2013		Year 2017	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Region North-West	42.1	41.3	51.5	49.0	39.2	37.0	44.6	41.4
Region Centre	40.6	40.7	45.6	45.9	34.5	34.4	39.2	37.8
Region North-East	58.6	65.2	70.8	76.6	63.0	59.6	60.8	65.2
Region South-East	48.1	49.5	52.5	56.0	39.6	42.8	42.2	48.7
Region South-Muntenia	57.4	56.9	62.9	65.7	45.8	49.1	47.0	54.5
Region Bucharest - Ilfov	45.0	39.5	84.1	73.7	63.3	60.9	73.9	57.1
Region South-West	43.4	46.3	47.4	51.4	32.5	35.9	33.5	39.0
Region West	39.1	34.7	44.2	40.8	32.7	30.9	39.0	36.4

Source: National Institute of Statistics, Tempo-Online, accessing and processing data 03, 2019.

This trend is due to the shortage of jobs, which determines the residents of this region to migrate to other more developed regions in the country and most of the time abroad. Also, a very big impact it has that the majority of young people living in this region choose, after they graduate from high school, to follow the courses from the Bucharest-Ilfov or South-East regions universities, which leads to changing their residence over time [4] [5] [6].

CONCLUSIONS

During the analyzed period, a negative trend is observed in the South-Muntenia region regarding the numerical evolution of the population, trend that is present both on the whole territory of the country as well as at the level of the European Union and the development of this tendency is highlighted mostly due to the increase in the negative birth rate registered in recent years and the increase in life expectancy, which led to the increase of the population aged 60 and over 60 years.

Although the South-Muntenia region is ranked the 2nd in Romania in terms of population, it is also the 2nd, but this time downwards, in terms of population growth over the reference period, registering a decrease of just over 4% in 2018 as compared to 2014.

The decline of the population of South-Muntenia Region can not be attributed solely to the negative birth rate or the decrease of the number of people aged 15 to 59 who mostly support the number of people aged 60 and over by paying contributions to state, but also on the back of the internal and external migration movement, a phenomenon that is quite accentuated. The negative sign of the balance of internal migration across the region in 2017 (-7,507) and the fact that during the reference period migration has increased by 130%, represent extremely important factors which must be taken into account at the demographic analysis of the region, these figures greatly influencing the resulting trend.

In conclusion, taking into consideration all the above mentioned, we can firmly say that the trend of the population of the South-

Muntenia region, during the reference period, is a descending one

REFERENCES

[1]Condei, R., Alecu, I. N., Popescu, A., Ciocan, H. N., 2016, The analysis of the human resources involved in the roural tourism in Romania, Scientific Papers: Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 16 (2), 85-94.
[2]Eurostat Statistical Database, 2019, www.ec.europa.eu/eurostat, Accessed on March 2019.
[3]FAO- Food and Agriculture Organization, 2019, Statistical data, www.fao.org/home/en/, Accessed on March, 2019.
[4]National Institute of Statistics, 2017, Statistical Yearbook of Romania.
[5]National Institute of Statistics, 2017, Designing the Population of Romania, in territorial profile.
[6]National Institute of Statistics, 2017, Social trends.
[7]National Institute of Statistics, 2019, Tempo-Online, Accessed on March, 2019.
[8]Popescu, A., Dinu, T.A., Stoian, E., 2018, Demographic and economic changes characterizing the rural population in Romania, Scientific Papers: Series Management, Economic Engineering in Agriculture and Rural Development, Vol. 18 (2), 333-346.
[9]South-Muntenia Regional Development Agency, 2013, Socio-economic analysis of South-Muntenia Region.
[10]South-Muntenia Regional Development Agency, 2012, Study on Social Issues and Quality of Life at South-Muntenia Region.
[11]United Nations, 2017, World Population Perspectives - The 2017 Review, New York.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE AGRO-CLIMATIC RESOURCES OF THE YEAR 2015 AND THEIR IMPACT ON THE AGRICULTURAL CROPS IN THE SOUTH – WEST OF ROMANIA

Dana Maria (OPREA) CONSTANTIN[1], Nicoleta IONAC[1], Ion MARINICĂ[2], Victor Viorel VĂTĂMANU[3], Andreea Floriana MARINICĂ[4], Elena GRIGORE[1], Elena BOGAN[1], Irina ONȚEL[5]

[1]University of Bucharest, Faculty of Geography, 1 Nicolae Bălcescu Avenue, 010041, District 1, Bucharest, Romania, Email: danamartines@yahoo.com, ionac.nicoleta@gmail.com, elazigzag@gmail.com, elana.bogan@yahoo.com
[2]University of Craiova, Faculty of Sciences, 13 A.I. Cuza Street, 200585, Craiova, Romania, Emails: ionmarinica@yahoo.com
[3]Regional Meteorological Center Oltenia, 3A Brestei Street, 200581, Craiova, Romania, Email: victor.vatamanu@gmail.com
[4]Jacobs University, 1 Campus Ring, 28759, Bremen, Germany, Email: marinica.andreea@gmail.com
[5]National Meteorological Administration, 97 București-Ploiești Street, 013686, Bucharest, Romania, Email: ontel.irina@yahoo.com

Corresponding author: danamartines@yahoo.com

Abstract

Knowing the agro-climatic resources is a compulsory condition in order to implement a sustainable agricultural management. The main purpose of this study is to analyze and evaluate the agro-climatic resources in relation with the bio-climatic requirements of the main summer cultures, such as maize and sunflower. The analysis will be done for the South-West of Romania, for the year 2015. The year 2015 is considered the warmest year in Romania. The analysis of temperature and precipitation resources will be based on the climatic data from 15 weather stations. The impact of the agro-climatic resourses on the maize and sunflower crops will be analyzed both on the surface and production data provided by the National Institute of Statistics and on the satellite images for the NDVI index. From the analysis, one could that the monthly interval of April-August 2015 was characterized by high temperatures and a scarce precipitation regime. This reflected in the agricultural yields of maize and sunflower, because this range corresponds to the development of the phenological phases of these crop plants.

Key words**:** *agricultural crops, agricultural management, temperature, precipitation, the South-West of Romania*

INTRODUCTION

The global climate warming phenomenon has already been highlighted by the analysis of the climatic data over long periods of time. The same trend of climate warming has also been highlighted in Romania by the calculation of the linear trends and their statistical significance for the annual and seasonal average temperatures [3]. According to the World Meteorological Organization (WMO), the last four years (2015, 2016, 2017 and 2018) are the warmest years, comparing to the pre-industrial period (1850-1900) [13]. In Romania, according to the National Meteorological Administration (NMA), 2015 is the warmest year, with a positive anomaly of 1.7°C, comparing to the multiannual average over the period 1900-2018 [12]. Between 1900-2018, the heating rate was 1.05°C [12].

The aim of the study is to analyze the temperature and precipitation resources of the year 2015 in relation to the main summer plant cultures, such as maize and sunflower, for the South-Western Romania. The South-West of Romania or the South-West Oltenia Development Region represents 12.2% of the country's area and is characterized by varied landforms, with altitudes increasing from South to North, from 25-36 m to over 2,000 m [5], being an important agricultural region of

the country (Fig. 1). The geographical area is characterized by a mid-latitude continental climate, influenced by a multitude of air masses: polar, maritime, tropical and arctic [7]. Comparing to the multiannual average of the period 1901-1990, the year 2015 was warm, with the annual average temperature for the entire region of 12°C and with a positive anomaly of 1.9°C for the South-West of Romania. In terms of annual precipitations, for the entire region, the year 2015 was normal. The climatic factors such as air temperature, soil surface temperature and atmospheric precipitation influence the physiological processes of the agricultural plants, with inferior and superior thresholds for each stage of development, beyond which the thermal or hydric stress occurs [4].

MATERIALS AND METHODS

In the agro-climatic analysis of the year 2015, the weather data from 15 weather stations (w.s.) in the administration of the National Meteorological Administration (NMA) of the Regional Meteorological Center of Oltenia referring tothe monthly average, minimum and maximum air and surface soil temperatures and monthly precipitation amounts have been used (Fig. 1).

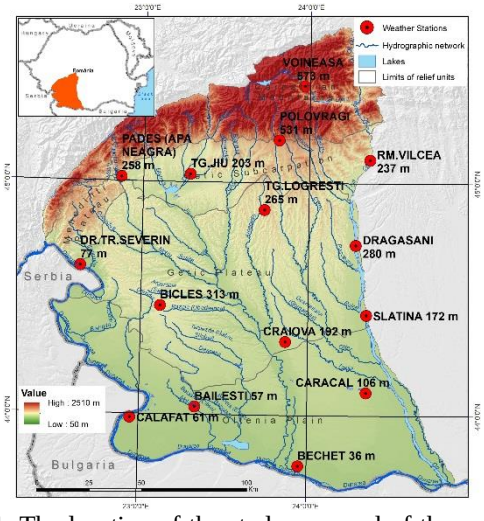


Fig. 1. The location of the study area and of the weather stations. Source: own processing from GIS open sources

The monthly and annual values of the year 2015 are compared to the monthly and annual averages from 1901 to 1990.

The agro-climatic information produced by NMA is also added. There were also calculated the Spring Arrival Index as the sum of the positive daily average air temperature values for the period between February 1 to April 10, 2015, thus expressing the thermic potential of winter to spring transition period [1, 2].
The Hellmann Criterion has been used in order to determine the weather types (Table 1).

Table 1. The matrix of the weather types according to the Hellman Criterion.

Types of temperature time	Anomaly from the multiannual average (°C)	Types of precipitation time	Anomaly from the multiannual average (%)
excessively cold (EC)	≤ -5.0	excessively droughty (ED)	> -50.0
very cold (VC)	- 4.9...-2.6	very droughty (VD)	- 50...-30.1
cold (CL)	-2.5...-1.1	droughty (D)	-30...-20.1
cool (CO)	- 1.0...-0.6	slightly dry (SD)	- 20...-10.1
normal (N)	± 0.5	normal (N)	± 10
slightly warm (SW)	0.6 – 1.0	slightly rainy (SR)	10.1 – 20
warm (W)	1.1 – 2.5	rainy (R)	20.1 – 30
very warm (VW)	2.6 – 4.9	very rainy (VR)	30.1 – 50
excessively warm (EW)	≥ 5.0	excessively rainy (ER)	> 50.0
Types of spring		**Anomaly from the multiannual average (%)**	
excessively late (EL)		≤-70	
very late (VL)		-69.9...-50	
late (L)		-49.9...-30	
slightly late (SL)		-29.9...-10	
normal (N)		-9.9...+10	
slightly early (SE)		10.1...30	
early (E)		30.1...50	
very early (VE)		50.1...69.9	
excessively early (EE)		≥70	

Source: adapted after Marinică and Marinică, 2016.

The health status of the agricultural crops for the year 2015 is highlighted by the Normalized Difference Vegetation Index (NDVI) extracted from the MOD13Q1 satellite products with a resolution of 250 m.
Also, crop production and surface data from the National Statistics Institute (NSI) have been used for maize and sunflower in order to highlight the role of the climatic conditions on the agricultural yields.
The land coverage information was based on the European Reference Data Set - Corine Land Cover 2015.

RESULTS AND DISCUSSIONS

The characteristics of the agro-climatic resources of the year 2015

In January 2015, the air temperature has recorded monthly average values between 2.1°C at Dr. Tr. Severin and -0.4°C at Voineasa, being the only negative monthly average in the whole region. These monthly averages, compared to the averages of the period 1901-1990, have recorded deviations between 4.3°C at Voineasa and 2.6°C at Padeş. At the level of the South-West Oltenia Development Region, the monthly average air temperature for January was 0.6°C, recording a deviation from the period 1901-1990 of 3.4°C, which confirms that the month was warm for this region.

The minimum monthly air temperature values were recorded on January 1st and were between -29.8°C at Padeş and -13.9°C at Dr. Tr. Severin and Drăgăşani, and their average value for the whole region was -19.6°C. Since January 3rd, the weather has warmed up and has been warmer than normal throughout the month. A moderate heat wave occurred between January 9 and January 16 and a mild one between January 29 and January 31. As a result, the maximum monthly temperatures reached maximum values on January 11 and recording a 7.5°C point difference between 19.5°C in the South and 12.0°C in the North of the region. The monthly average air temperature maxima for January in the South-Western Romania was 15.5°C. The soil surface temperature recorded values between -31.0°C at Padeş and -9.9°C at Calafat for the meteorological parameter – the minimum monthly temperature. The monthly average minimum soil surface temperature was -22.1°C for the entire study area. The maximum monthly soil surface temperatures reached maximum values which ranged from 10.3°C at Slatina to 20.0°C at Drăgăşani. The maximum monthly average soil surface temperature was 13.4°C for the entire region. In terms of precipitations, January was characterized by monthly volumes, ranging from 88.8 l/m2 at Padeş and 15.1 l m2 at Bâcleş. At the level of the South-West Oltenia Development Region, the monthly average amount of precipitation was 43.0 l/m2. This monthly average precipitation amount compared to the monthly average amount for the period 1901-1990 had a deviation of -2.1%, indicating that January was normally rainy. The precipitation deficit was recorded in large areas in the South of the region and in restricted areas in the West and North-East of the region.

The monthly average air temperatures for February ranged between -0.7°C at Voineasa (the only negative value) to 2.3°C at Dr. Tr. Severin and Rm. Vâlcea, and their anomalies from the monthly average of the interval 1901-1990 ranged between 2.3°C at Rm Valcea and 0.7 °C at Calafat and Băileşti. Therefore, according to the Hellmann Criterion, February, was a warm month (W) for the most part of the region. February was warm (W) for the meteorological stations Rm. Vâlcea, Tg. Jiu, Drăgăşani and Caracal. At the level of the region, February 2015 was a warm month (W), recording a monthly average of 0.9°C and a deviation of 1.7°C over the period 1901-1990. The monthly air temperature minima ranged from -18.2°C at Băileşti and 7.6°C at Dr. Tr. Severin and with an average of -12.0°C for the entire study area. The monthly air temperature maxima varied between 16.4°C at Rm. Vâlcea and 11.6°C at Calafat, with an average for the entire study area of 13.7°C. At the soil surface, the minimum temperatures ranged between -21.0°C at Băileşti to -9.0°C at Rm. Vâlcea, and their average for the whole region was -14.0°C. The maximum soil surface temperatures ranged between 16.1°C at Slatina and 23.0°C at Padeş, and their average for the whole region was 20.3°C.

The monthly precipitation amounts ranged between 28.2 l/m^2 at Bechet to 89.7 l/m^2 at Padeş, and their percentage anomalies from the multiannual averages 1901-1990 ranged between -28.7% at Polovragi to 78.8% at Băileşti. By applying the Hellmann Criterion, there appears that February was characterised by droughty (D) on restricted areas at Polovragi and Tg. Logreşti, slightly dry conditions (SD) at Bechet, normal conditions at Caracal, Slatina and Rm. Vâlcea, slightly rainy regime (SR) at Rm. Vâlcea, rainy regime (R) at Dr. Tr. Severin and Tg. Jiu, very rainy regime (VR) at Calafat, Craiova and Padeş and excessivelty rainy regime (ER) at Băileşti. The monthly average quantity for the whole region was 47.1 l/m^2, and

its percentage anomaly from the period 1901-1990 was 11.8%, indicating that February was a slighty rainy month for the whole region.

Table 2. The temperature and precipitation regime of the spring of 2015

the weather station	H (m)	SAI (°C)	Type	The temperature regime (°C)			
				N	T	Δ =T-N	HCr
Dr. Tr. Severin	77	385.1	N	11.6	12.8	1.2	W
Calafat	66	358.6	N	11.6	12.9	1.3	W
Bechet	65	350.2	N	11.6	12.5	0.9	SW
Băileşti	56	351.9	SE	11.6	12.5	0.9	SW
Caracal	112	348.8	SE	11.2	12.4	1.2	W
Craiova	190	325.7	SE	11.2	12.0	0.8	SW
Slatina	165	332.4	SE	11.1	12.0	0.9	SW
Bâcleş	309	286.1	SE	10.1	11.1	1.0	W
Tg. Logreşti	262	291.0	SE	9.7	10.6	0.9	SW
Drăgăşani	280	346.6	E	10.5	12.0	1.5	W
Padeş	250	293.8	SE	9.8	11.1	1.3	W
Tg. Jiu	210	342.0	SE	10.5	11.9	1.4	W
Polovragi	546	256.7	SE	9.2	10.2	1.0	W
Rm. Vâlcea	243	360.7	SE	10.4	12.0	1.6	W
Voineasa	587	193.7	SE	7.4	8.5	1.1	W
Oltenia average	-	321.6	SE	10.5	11.6	1.1	W

the weather station	H (m)	The precipitation regime (l/m²)				
		P	NP	Δ=P-NP	Δ%	HCr
Dr. Tr. Severin	77	141.6	186.5	-44.9	-24.1	D
Calafat	66	118.3	146.2	-27.9	-19.1	D
Bechet	65	164.9	143.5	21.4	14.9	SD
Băileşti	56	121.5	157.8	-36.3	-23.0	D
Caracal	112	120.5	142.2	-21.7	-15.3	SD
Craiova	190	219.5	135.2	84.3	62.4	ER
Slatina	165	141.7	149.7	-8.0	-5.3	N
Bâcleş	309	107.6	172.5	-64.9	-37.6	VD
Tg. Logreşti	262	150.3	161.2	-10.9	-6.8	N
Drăgăşani	280	158.7	147.2	11.5	7.8	N
Padeş	250	176.6	248.8	-72.2	-29.0	VD
Tg. Jiu	210	113.5	193.1	-79.6	-41.2	VD
Polovragi	546	166.7	225.2	-58.5	-26.0	D
Rm. Vâlcea	243	139.6	192.6	-53.0	-27.5	VD
Voineasa	587	91.8	200.6	-108.8	-54.2	ED
Oltenia average	-	142.2	173.5	-31.3	-18.0	SD

H – altitude of the weather stations; SAI – Spring Arrival Index; Type – type of spring warming; N – the multiannual average temperature (1901-1990); T –the annual average temperature; Δ=T-N – the annual average temperature anomaly from the multi-annual average; P – the precipitation amount; NP – the multiannual precipitations (1901-1990); Δ=P-NP – the deviation of the annual precipitation amount from the multiannual amount; Δ% – the percentage anomalies of the annual precipitation amount from the multiannual amount; HCr = Hellmann Criterion.
Source: temperature and precipitation data from NMA.

The gradual increase of air temperature, which occurs during the last month of the winter - February and continues throughout spring, determines the climatic process of spring warming. For the year 2015, the sping arrival indices had values between 385.1°C at Dr. Tr. Severin and 193.7°C at Voineasa. For the South-West Oltenia Development Region, the average spring arrival index was 302.9°C with percentage deviations of 34.4% in Drăgăşani and 4.3% in Calafat compared to the period 1901-1990 (Table 2).

According to the Hellmann Criterion, it appears that the spring warming of 2015 was normal (N) in the extreme West and South-West (at Dr. Tr. Severin, Calafat and Bechet) and slightly early (SE) in most of the region and only early (E) in the Drăgăşani area. The anomaly of the average sputtering Index for the whole region was 2.6%, indicating that spring warming in 2015 was slightly early (SE). The slightly early spring warming has determined the beginning of the crop vegetation since the last decade of February. In spring, the average air temperature for the South-West region of Romania was 11.6°C, oscillating between 12.9°C at Calafat and 8.5°C at Voineasa (Table 2). Compared to the period 1901-1990, the annual average deviations were between 1.6°C at Rm. Vâlcea and 0.8°C at Craiova, with a deviation for the whole region of 1.1°C (Table 2).

As a result, the spring of 2015, in the South-West Oltenia Development Region was warm (W). The increase of the monthly average temperatures across the region from February to March was 4.4°C, from March to April was 5.0°C, and from April to May was 6.7°C, the latter being the highest of all the spring and even throughout the year, which caused an explosive development of all the plant species, as well as the increased water requirements for the agricultural crops. The average temperature increase throughout the spring months was 16.1°C.

The maximum monthly air temperatures varied from 23.3°C in April at Polovragi to 28.7°C at Bechet. The average air temperature maxima for the South-West of Romania was 26.1°C in 2015. The maximum monthly temperatures in May varied between 31.8°C at Bechet and 26.3°C at Polovragi. At the region level, the average air temperature maxima for May was

29.4°C. In April, the soil surface temperature reached maximum values of 53.2°C at Dr. Tr. Severin and 27.7°C at Caracal, with an average for Romania of 41.2°C. The maximum soil surface temperature values in May were 58.0°C at Băileşti and 37.7°C at Caracal, with an average for Romania of 45.0°C. These high thermic values have produced important stationary pressures in the agricultural crops and the lack of atmospheric precipitation has led to a drastic reduction of the water reserve in the soil and the intensification of the soil drought.

The annual precipitation amounts ranged between 91.8 l/m^2 at Voineasa to 219.5 l/m^2 at Craiova, and their percentage abatement from the 1901-1990 multiannual values ranged from -79.6% to Tg. Jiu and 84.3% at Craiova, which according to the Hellmann Criterion, determined the classification of the precipitation time types from excessively droughty (ED) at Voineasa, to excessively rainy (ER) at Craiova (Table 2). The singular situation at Craiova weather station is due to the high precipitation amounts from March (100.3 l/m^2) and May (85.2 l/m^2). Most of Oltenia's precipitations were low, and the atmospheric drought had different degrees of intensity, ranging from slightly dry (SD) to excessively droughty conditions (ED) (Table 2). The rainiest month of spring was March, with precipitations ranging from 47.0 l/m^2 to 100.3 l/m^2 at Craiova, with an average of 67.0 l/m^2 for the entire region. April and May were, on average, very droughty over the entire South-Western region of Romania. As a result of the atmospheric drought, correlated with the high air temperatures at the end of spring, the moisture reserve on the soil profile 0-100 cm has registered water deficiencies, locally in the East of the study area. In Oltenia, on extended surfaces, the water supply of the soil was pretty satisfactory and close to optimal limits, which demonstrates the importance of precipitations during winter and the first month of spring [9].During the summer of the year 2015, the average air temperatures varied between 18.1°C at Voineasa and 24.7°C at Dr. Tr. Severin and their deviation from the 1901-1990 multiannual averages were between 0.8°C at Bechet and 3.1°C at Padeş (Table 3).

Table 3. The temperature and precipitation regime of the summer of 2015

the weather station	H (m)	The air temperature regime (°C)					
		N	T	Δ = T-N	HCr	T_{max} VII	T_{max} VIII
Dr. Tr. Severin	77	22.0	24.7	2.7	VW	38.5 /20	38.9 /12
Calafat	66	22.3	24.2	1.9	W	39.4 /20	40.9 /12
Bechet	65	22.2	23.0	0.8	SW	38.5 /20	38.3 /16
Băileşti	56	22.1	23.6	1.5	W	37.3 /30	38.1 /12
Caracal	112	22.0	23.8	1.8	W	38.3 /30	37.0 /16
Craiova	190	21.7	23.2	1.5	W	37.3 /20	36.8 /12
Slatina	165	21.6	23.2	1.6	W	37.3 /30	36.8 /16
Bâcleş	309	20.4	22.6	2.2	VW	35.9 /20	36.7 /11
Tg. Logreşti	262	19.9	21.1	1.2	W	35.7 /30	35.7 /16
Drăgăşani	280	20.9	23.0	2.1	VW	36.6 /30	35.5 /12;16
Padeş	250	19.1	22.2	3.1	VW	36.5 /20	38.8 /12
Tg. Jiu	210	20.5	23.2	2.7	VW	38.0 /7	38.9 /12
Polovragi	546	18.9	21.1	2.2	VW	33.7 /20	34.9 /12
Rm. Vâlcea	243	20.2	22.8	2.6	VW	38.1 /18	39 /12
Voineasa	587	16.2	18.1	1.9	W	33.3 /7;8	33.0 /12;13
Oltenia average	-	20.7	22.1	1.4	W	37.0	37.2

the weather station	H (m)	The precipitation regime (l/m^2)				
		P	NP	Δ = P-NP	Δ%	HCr
Dr. Tr. Severin	77	87.4	160.0	-72.6	-45.4	ED
Calafat	66	125.6	146.8	-21.2	-14.4	SD
Bechet	65	193.2	146.8	46.4	31.6	VR
Băileşti	56	126.6	150.5	-23.9	-15.9	SD
Caracal	112	155.0	167.4	-12.4	-7.4	N
Craiova	190	190.2	164.7	25.5	15.5	SR
Slatina	165	302.6	184.9	117.7	63.7	ER
Bâcleş	309	198.3	152.5	45.8	30.0	VR
Tg. Logreşti	262	158.8	165.4	-6.6	-4.0	N
Drăgăşani	280	163.1	185.6	-22.5	-12.1	SD
Padeş	250	164.8	232.0	-67.2	-29.0	VD
Tg. Jiu	210	115.8	219.2	-103.4	-47.2	ED
Polovragi	546	261.2	277.7	-16.5	-5.9	N
Rm. Vâlcea	243	128.5	254.3	-125.8	-49.5	ED
Voineasa	587	235.5	268.1	-32.6	-12.2	SD
Oltenia average	-	173.5	191.7	-17.9	-9.4	N

H – altitude of the meteorological station; N – the multiannual average temperature (1901-1990); T – the annual average temperature; Δ=T-N – the anomaly of the average temperature from the multiannual average; T_{max}VII – the maximum monthly temperature in July/date of recording; T_{max}VII – the maximum monthly temperature in August/date of recording; P – the annual precipitation amount; NP – the multiannual precipitation amount (1901-1990); Δ=P-NP – the deviation of the annual precipitation amount from the multiannual amount; Δ% – the percentage anomalies of the annual precipitation amount from the multiannual amount; HCr – the Hellmann Criterion.
Source: the temperature and precipitation data from NMA.

According to the Hellmann Criterion, the summer of 2015 was warm (W) on a restricted area in the extreme South of the Bechet region and warm (W) and very warm (VW) in the rest of the region (Table 3).

The annual average air temperature calculated for the whole region was 22.1°C and its anomaly from the 1901-1990 period was 1.4°C, indicating that the summer of the year 2015 was warm (W) (Table 3).

June 2015 was sligtly warm (SW), with maximum air temperatures between 29.4°C at Voineasa and 35.6°C at Dr. Tr. Severin. The warmest summer months were July and August. July was warm (W) throughout the region, with the average monthly average for Oltenia of 24.2°C being the highest monthly average throughout the year. The maximum monthly air temperatures in July were recorded mostly on July 20th and July 30th, and ranged between 33.3°C at Voineasa to 39.4°C at Calafat (Table 3). According to the monthly report of the National Oceanic and Atmospheric Administration (NOAA), July 2015 has recorded the highest monthly average temperature of 16.61°C from 1880 to nowadays, at global level [6]. August was a sligtly warm month (SW) for the entire region, with a monthly average of 22.4°C. The increase in the monthly average air temperature from May to June was of 2.5°C, from June to July of 4.5°C, and from July to August of -2.2°C, being the first decrease in the monthly average during the year. The increase from spring to summer in the average season for the whole region was 10.5°C, the summer average being almost twice as high as in spring. The maximum air temperatures in August were recorded on August 12 and August 16 and varied between 33.0°C at Voineasa and 40.9°C at Calafat (Table 3).

At the ground level, in June, the maximum monthly temperatures varied between 33.5°C at Caracal and 66.0°C at Băileşti and their average value for the whole region was 51.2°C. In July, the maximum monthly soil temperature oscillated between 40.0°C at Caracal to 69.5°C at Padeş while their average correspondent value for the whole region was 54.3°C. August was characterized by the highest soil surface temperature of 39.2°C at Slatina and 69.8°C at Padeş while their average value for the whole region was 54.6°C. During the summer and the first autumn month, five heatwaves lasting for 37 days, accounting 40.2% of the total summer days were recorded. As a result, the air and the prolonged soil thermal stress associated with the atmospheric and soil drought forced growth of plants, maturing and early baking, leading to major crop losses in all types of the agricultural crops [9].

The annual precipitation amounts ranged from 87.4 l/m^2 at Dr. Tr. Severin to 302.6 l/m^2 at Slatina, and their percentage deviation from the 1901-1990 multiannual quantity ranged from -49.5% at Rm. Vâlcea to +63.7% at Slatina, leading to the classification of the seasonal precipitation time types from excessively rainy (ER) at Slatina to excessively droughty (ED) on the lineage of the weather stations Rm. Vâlcea, Tg. Jiu and Dr. Tr. Severin (Table 3). The summer of 2015 was characterized by an average amount of 183.1 l/m^2 for the whole study area, and a percentage deviation of -9.4% compared to 1901-1990, which means it was a normal rainfall summer (Table 3). Only at Bechet, in the extreme South of the region, the weather was very rainy (VR). In most of the study region, there was a dry weather. Precipitations were recorded on small areas at Craiova, Slatina and Bâcleş. The monthly precipitation amount in June ranged between 25.2 l/m^2 at Dr. Tr. Severin and 137.0 l/m^2 at Bechet, and their average value for the entire region was 79.6 l/m^2, the percentage anomaly from 1901-1990 was -5.4%, which means a normal precipitation month, on average. There were 27 rainy days, but most of the daily precipitations were insignificant. In June, important precipitation deficits that generated atmospheric and soil drought, associated with the progressive increase in air and soil temperature, were recorded in the Northern Oltenia and in the extreme West, at Dr. Tr. Severin. The monthly precipitation amount in July ranged between 1.6 l/m^2 at Bechet and 65.8 l/m^2 at Voineasa. For the South-West Romania Development Region, the monthly average precipitation amount for July was 26.2 l/m2, with deviations between -96.4% at

Băileşti and -25.7% at Voineasa, compared to the period 1901-1990. Consequently, at the region level, July was an excessively droughty month (ED), excepting the restricted Voineasa area where it was droughty (D) according to the Hellmann Criterion. In Oltenia, the drought manifested itself strongly during the period July 1st-August 8th, for 46 days, representing 50.0% of the total summer days.

The monthly precipitations in August ranged from 39.2 l/m^2 at Calafat to 149.6 l/m^2 at Slatina and the percentage anomalies from the average 1901-1990 monthly amount varied between -33.1% at Tg. Jiu and 219.7% at Slatina which, according to the Hellmann Criterion, shows that August was very droughty (VD) on a restricted area at Tg. Jiu (the only area with a monthly drought) and excessively rainy (ER) over an extended area (Craiova, Slatina, Bâcleş, Tg.Logreşti and Polovragi) in the rest of the region, the precipitation excess having intensities which ranged from slighty rainy (SR) to very rainy conditions (VR). Between August 16 and August 22, heavy precipitations occured in much of the region, thus interrupting the drought period but the atmospheric drought returned and lasted from August 23 to September 8.

The autumn of 2015 was characterized by average air temperature values between 9.3°C at Voineasa and 13.5°C at Dr. Tr. Severin, and their deviation from the 1901-1990 multiannual average varied between 0.9°C at Tg. Logreşti and Padeş and 2.1°C at Voineasa and Parâng. Based on the Hellmann Criterion, these anomalies show that the autumn of 2015 was warm (W) in most of the region (Table 4). The annual air-temperature average for the whole region was 12.2°C, and its deviation from the 1901-1990 multiannual average was 1.2°C, which confirms that the autumn of 2015 was warm (W) (Table 4). The month of September was warm in general, with monthly maximum temperatures in the first days of the month ranging from 31.4°C at Voineasa (September 1st) to 37.7°C at Calafat (September 1st). At the level of the South-West region of Romania, the monthly average air temperature maxima for September was 35.4°C. The maximum monthly soil surface temperature, in September, oscillated between 61.0°C and 35.8°C, with an average of 49.3°C for the entire region.

Table 4. The temperature regime and the precipitation regime of the autumn of 2015

the weather station	H (m)	The air temperature regime (°C)					
		N	T	Δ = T-N	HCr	T_{max} IX	T_{max} X
Dr. Tr. Severin	77	12.3	13.5	1.2	W	37.1/3	23.2/6
Calafat	66	12.1	13.3	1.2	W	37.7/1	24.7/5
Bechet	65	11.5	12.5	1.0	SW	37.5/3	23.8/4
Băileşti	56	11.5	12.8	1.3	W	37.4/5	24.5/5
Caracal	112	11.6	13.0	1.4	W	36.6/5	22.8/6
Craiova	190	11.5	12.6	1.1	W	35.2/2	22.8/6
Slatina	165	11.6	12.6	1.0	SW	35.9/2	23.1/6
Bâcleş	309	10.8	12.3	1.5	W	34.4/2;3	21.9/5
Tg. Logreşti	262	10.3	11.2	0.9	SW	34.1/2	22.4/6
Drăgăşani	280	11.6	13.0	1.4	W	35.1/2	22.7/6
Padeş	250	10.3	11.2	0.9	SW	35.0/2	22.5/6
Tg. Jiu	210	10.8	11.9	1.1	W	35.8/3	23.3/6
Polovragi	546	10.2	11.5	1.3	W	32.3/18	19.8/6
Rm. Vâlcea	243	10.7	12.5	1.8	W	36.0/2	23.6/6
Voineasa	587	7.2	9.3	2.1	W	31.4/1	20.5/3
Oltenia average	-	11.0	12.2	1.2	W	35.4	23.5

the weather station	H (m)	The precipitation regime (l/m^2)				
		P	NP	Δ = P-NP	Δ%	HCr
Dr. Tr. Severin	77	331.7	186.3	145.4	78.0	ER
Calafat	66	225.6	141.8	83.8	59.1	ER
Bechet	65	205.5	134.7	70.8	52.6	ER
Băileşti	56	217.3	137.9	79.4	57.6	ER
Caracal	112	299.7	123.4	176.3	142.9	ER
Craiova	190	317.4	122.1	195.3	160.0	ER
Slatina	165	313.3	132.2	181.1	137.0	ER
Bâcleş	309	182.3	144.2	38.1	26.4	ER
Tg. Logreşti	262	261.3	135.7	125.6	92.6	ER
Drăgăşani	280	302.8	153.2	149.6	97.7	ER
Padeş	250	464.8	214.3	250.5	116.9	ER
Tg. Jiu	210	294.6	180.1	114.5	63.6	ER
Polovragi	546	338.8	209.0	129.8	62.1	ER
Rm. Vâlcea	243	350.8	156.8	194.0	123.7	ER
Voineasa	587	188.1	164.5	23.6	14.3	SR
Oltenia average	-	286.3	155.7	130.6	83.8	ER

H – altitude of the meteorological station; N – the multiannual average temperature (1901-1990); T – the annual average temperature; Δ=T-N – the annual average temperature devation from the multiannual average temperature; T_{max}IX – the maximum monthly temperature in September/date of registration; T_{max}X – the maximum monthly temperature in October/date of registration; P – the annual precipitations; NP – the multiannual precipitation amount (1901-1990); Δ=P-NP – the deviation of annual precipitation amount anomalies from the multiannual precipitation amount; Δ% – the percentage anomalies of the annual precipitation amount from the multiannual amount; HCr – Hellmann Criterion.
Source: temperature and precipitation data from NMA

The monthly average air temperature in October ranged from 11.3°C at Dr. Tr. Severin and 7.8°C at Voineasa, and their deviations from the 1901-1990 period ranged between -1.1°C at Calafat and +0.2°C at Rm.Vâlcea, making it a thermally normal month in most of Oltenia.

The monthly air temperature average calculated for the whole region was 9.8°C, and its anomaly from the 1901-1990 period was -0.6°C, which confirms that October was, on average, a thermally normal month for the entire region.

The maximum monthly air temperatures were recorded on October 5 and October 6 and ranged between 19.8°C at Voineasa and 24.7°C at Calafat. The optimum air and soil surface temperatures allowed the establishment of the autumn crops until November 23, creating favorable conditions for the onset of the upcoming agricultural year 2015-2016. On the ground, the maximum temperatures ranged from 24.3°C at Slatina to 36.4°C at Băileşti, in October.

November was characterized by mean air temperature values ranging between 4.9°C at Voineasa and 9.4°C at Calafat and their anomalies from the average value of the 1901-1990 period ranged between 1.3°C at Padeş and 3.4°C at Calafat, indicating that this month was warm (W) in most of Oltenia. The monthly average air temperature calculated for the whole region was 7.5°C with a positive anomaly of 2.6°C over the period 1901-1990. The air temperature recorded most of the monthly maxima in the second decade of November, ranging from 24.9°C at Calafat and 19.0°C at Voineasa. For the study area, the monthly average maxima was 21.9°C. Regarding the soil surface temperature, the maximum monthly values varied between 32.3°C at Rm. Vâlcea and 18.2°C at Slatina, and the average of the monthly maxima was 21.9°C for the whole study area. All these indicate a high thermic potential in November 2015 and a high degree of the favorability for the autumn crops.

The decrease in the monthly average air temperature for the whole region was -4.1°C from August to September, -6.5°C from September to October (the largest decrease in the year 2015), and 2.3°C from October to November.

The annual precipitations ranged between 182.3 l/m^2 at Bâcleş and 464.8 l/m^2 at Craiova and their percentage anomalies from 1901-1990 ranged between 14.3% at Voineasa and 160.0% at Craiova, which shows that the autumn of 2015 was excessively rainy (ER) in most of Oltenia (Table 4). In 2015, the autumn recorded an average seasonal quantity, for the study area, of 286.3 l/m^2 and a percentage deviation of 83.8% compared to the interval 1901-1990, meaning that, in general, the autumn was excessively rainy (ER) on the whole region, according to the Hellmann Criterion (Table 4).

In September, the monthly precipitations ranged from 56.0 l/m^2 at Calafat to 165.4 l/m^2 at Padeş, and the percentage anomalies were 281.7% at Craiova and 44.7% at Calafat, compared to 1901-1990. As a result, September 2015 was, for most of the South-West Oltenia Development Region, an excessively rainy month (ER), according to the Helmann Criterion. The monthly average precipitation amount for the South-West of Romania was 63.2 l/m^2, recording a percentage deviation of 133.8% compared to 1901-1990, thus, this month is characterized by an excessively rainy time (ER).

In October, the monthly precipitations ranged between 31.1 l/m^2 at Voineasa and 192.6 l/m^2 at Padeş. According to the Hellmann Criterion, October was very droughty ,only at Voineasa (a percentage deviation of -44.6%, compared to 1901-1990), and for the rest of the region it was excessively rainy. For October, for all the study area, the monthly average amount was 83.8 l/m2, with a percentage deviation of 55.6% compared to the period 1901-1990, which confirms that October was excessively rainy, on average, in the entire region.

November was characterized by monthly precipitations which ranged between 27.2 l/m^2 at Bâcleş and 125.5 l/m^2 at Rm. Vâlcea, and their percentage anomalies from 1901-1990 ranged from -43.2% at Bâcleş to 145.6% at Caracal. The monthly average precipitations for the study area recorded the value of 90.9 l/m^2. November for the South-West region of Romania was excessively rainy (ER), with a percentage deviation of 58.9% compared to the period 1901-1990. The soil water reserve was optimal or near an optimum state în toamna

2015, in the South-West Romania Development Region [9]. Under warm (W) or slightly warm (SW) temperature conditions and with optimal or nearly optimal water reserves, the agricultural crops set up in the autumn of 2015 had good growing conditions.

December 2015 was characterized by a monthly average thermal regime with values ranging from 1.5°C (Voineasa) to 7.1°C (Calafat). This month, according to the Hellmann Criterion, was very warm (VW), with deviations between 3.4°C (Voineasa) and 6.3°C (Bâcleş) compared to the period 1901-1990. At the level of the South-West Oltenia Development Region, December 2015 had a monthly average value of 4.9°C, and its anomaly from the period 1901-1990 was 5.0°C, being one of the biggest anomalies in the history of the meteorological observations for December (at the country level being the third in descending order), which confirms that it was a very warm month (VW), on average, in the whole region. The maximum monthly air temperatures were recorded between December 22nd-28th and were totally atypical, ranging from 14.3°C at Voineasa to 19.3°C at Polovragi, while their average value for the entire region was 16.9°C. On the ground surface, the maximum monthly temperatures ranged between 9.9°C at Slatina to 25.3°C at Drăgăşani, and their average value for the whole region was 17.6°C. December was an excessively droughty month (ED) at all weather stations, the drought being mainly of atmospheric nature, but the water reserve in the soil remained optimal and the vegetation phases continued unabated throughout the month.

The impact of the agro-climatic resources on maize and sunflower crops

During the vegetative season, the agricultural crops have different demands on the climatic conditions.

The agro-meteorological parameters that evolve beyond the optimum necessary for the growth and development of the agricultural plants are considered stressors with unfavorable effects on the status of the vegetation and agricultural production [10].

The critical period regarding the temperature and maximum water consumption for the main summer crops, such as maize and sunflower, is the July-August interval [9, 10].

The impacts of temperature and precipitation resources on the status of vegetation and agricultural production were also analyzed by using the NDVI satellite index and the agricultural data for yields of the maize and sunflower.

For the year 2015, the spatial distribution of the arable land in the South-Western Romania or the South-West Oltenia Development Region is shown in Figure 2.

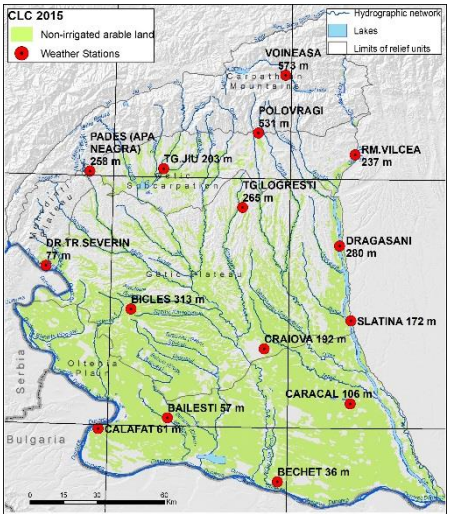


Fig. 2. The spatial distribution of the arable land in the South-West of Romania.
Source: own processing from CLC 2015.

By using the MODIS satellite imagery, the NDVI index has been calculated, indicating the biomass quality for June, July and August as a 16-day synthesis. NDVI is an index that varies between -1 and +1.

Positive NDVI values greater than +0.2 indicate good health for the vegetation, and values greater than 0.6 indicate dense vegetation that characterizes the forest areas in the temperate areas [8]. Figure 3 shows the space-time analysis of the NDVI index for the study area.

Based on Figure 3, there can be noticed that the NDVI index values decreased from June to August, indicating a deteriorating health status of vegetation, due to the low precipitation regime and the heat, which characterized this monthly interval corresponding to the development of the phenological phases of the maize and sunflower.

According to the National Institute of Statistics, the crop yields of maize and sunflower were lower as compared to 2014 and 2016, reflecting

the climatic context of the year 2015 (Table 5) [11].

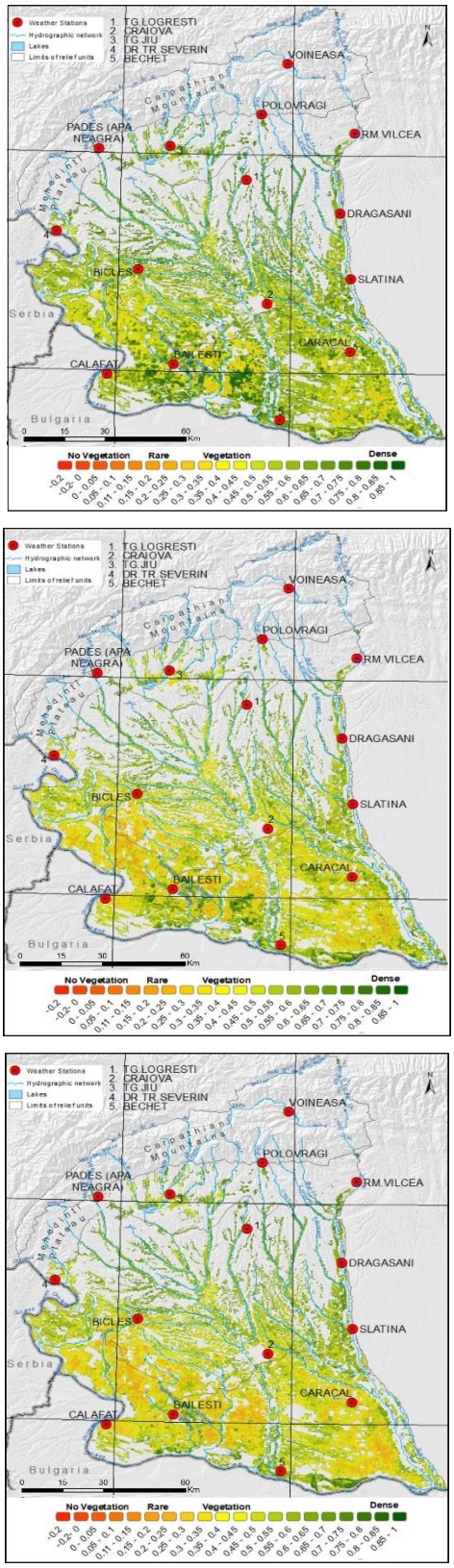


Fig. 3. The space-time distribution of the NDVI index values in June (above), July (middle) and August (down) 2015, in the South-Western Romania.
Source: own processing from MODIS satellite imagery

Table 5. The cultivated surface and the agricultural production of maize and sunflower in the South-West Oltenia Development Region.

Culture	Year	Surface (ha)	Production (tone)	Average of production (kg/ha)
Maize	2014	349,284	1,444,982	4,137
	2015	360,465	1,066,284	**2,958**
	2016	362,148	1,243,414	3,433
Sunflower	2014	123,446	268,521	2,175
	2015	128,564	209,666	**1,631**
	2016	185,838	300,572	1,617

Source: NIS processed data, 2019.

CONCLUSIONS

Overall, the year 2015 was warm (W), with the annual average anomaly from the previous century of 1.9°C, but a normal year from the precipitation point of view. The spring warming occured earlier. The spring was warm and, on average, sliaghtly dry, and the atmospheric and soil drought was dominant especially during the months of April and May. The summer was warm, with long periods of atmospheric and soil drought, but normal from precipitation point of view.
The autumn was warm and excessively rainy, which led to favorable conditions for the onset of the agricultural year 2015-2016.
The largest negative anomalies of the monthly precipitations were recorded in July and December. In September, the highest positive anomaly of the monthly precipitations has been registered. As a result, the atmospheric and soil drought during the spring and summer months deteriorated the health status of the vegetation and there were significant decreases in the agricultural crops for maize and sunflower, in the South-Western Region of Romania.

REFERENCES

[1]Bogdan, O., Marinică, I., Marinică, A. F., 2011. Indexes of Spring arrival between 2000 and 2010. Forum geografic. Studies and researches of Georgraphy and Environment protection (Studii şi cercetări de geografie şi protecţia mediului), Vol. 10(1): 129-139.
[2]Bogdan, O., Marinică, I., Marinică, A., F., 2017, Climatic anomalies in the spring of 2017 in Oltenia. Risks and Catastrophes. (Riscuri şi Catastrofe), Vol. 21(2)2017: 35-50.
[3]Busuioc, A., Caian, M., Cheval., S., Bojariu, R, Boroneant, C., Baciu, M., 2010, Variability and climate change in Romania. Pro Universitaria Publishing

House (Variabilitatea și schimbarea climei în România. Editura Pro Universitaria), Bucureşti, 226 p.
[4]Constantin (Oprea), D. Maria., Vătămanu, V.V., Cofas, E., Zaharia, I., 2016, Aspects concerning the demands of the winter wheat culture in comparison with the climatic conditions in the Caracal Plain. Case study: the agricultural year 2006-2007. Scientific Papers Series „Management, Economic Engineering in Agriculture and Rural Development", Vol. 16(2):103-109.
[5]Constantin (Oprea), D. M., Marinică, A. F., Marinică, I., Vătămanu, V.V., 2017, Record thermiques et pluviométriques dans le sud-ouest de la Roumanie pendant les deux dernières décennies. Actes du 30ème Colloque de l'Association Internationale de Climatologie, 339-344.
[6]Global climate report-July 2015. NOAA- National Centers for Environmental Information. https://www.ncdc.noaa.gov/sotc/global/201507, Accessed on January 12th 2019.
[7]Marinică, I., Marinică, A. F., 2016, (Climate variability in Oltenia and climate change. Universitaria Publishing House (Variabilitatea climatică în Oltenia şi schimbările climatice. Editura Universitaria), Craiova.
[8]Oprea, A. O., 2017, Agrometeorological indices, products and remote sensing products used in romanian drought monitoring system. https://www.met.hu/doc/rendezvenyek/WMO_EUMETSAT_2017/19-OanaAlexandra.pdf, Accessed on January 16th 2019.
[9]Raport anual 2015-Administrația Națională de Meteorologie. (Annual Report, National Meteorological Administration, http://www.meteoromania.ro/, Accessed on January 8th 2019.
[10]Sandu, I., Mateescu, E., Vătămanu, V.V., 2010, Climate changes in Romania and the effects on agriculture. Sitech Publishing House (Schimbări climatice în România şi efectele asupra agriculturii. Editura Sitech), Craiova, 406 p.
[11]Surface and vegetal agricultural production (Suprafața și producția agricolă vegetală). http://www.insse.ro/cms, Accessed on January 8th 2019.
[12]2018 was the 3rd warmest year since 1901 till present. Press Release Ministry of Environment (2018 a fost al treilea cel mai călduros an din 1901 în prezent. Comunicat de presă Ministerul Mediului). http://www.meteoromania.ro/, Accessed on January 12th 2019.
[13]WMO confirms past 4 years were warmest on record.https://public.wmo.int/en/media/press-release/wmo-confirms-past-4-years-were-warmest-record, Accessed on January 12th 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE INFLUENCE OF AGRICULTURAL INVESTMENTS ON INCOME FROM ROMANIAN AGRICULTURE

Georgiana Melania COSTAICHE, Anișoara CHIHAIA, Ioana NICULAE

University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile:+40744 6474 10, Emails: melania.sanda@yahoo.com, ani_chihaia@yahoo.com, niculae.ioana@yahoo.com

Corresponding author: melania.sanda@yahoo.com

Abstract

The purpose of this paper is to determine the influence of agricultural investments on the Romanian agriculture incomes, realizing in the same time their evolution. In Romania, agriculture is a basic branch of the national economy because it provides food for the population as well as raw materials for the consumer goods industry. The research was carried out on the basis of statistical data published by the National Institute of Statistics of Romania, taking into account a period of 13 years, respectively 2005-2017. The connection between the value of investments in agriculture and the value of the incomes obtained from agriculture in Romania is a direct and high intensity.

Key words**:** *agriculture, investments, income, Romania*

INTRODUCTION

A high-performing economy is based on investment, as it helps to increase labor productivity, create new jobs and thus increase GDP in a country.

The investment is the economic factor that materializes in material, financial and labor resources, for the replacement of the used means of production, for the improvement of the already existing means of production or for the creation of new means of production, with the purpose of obtaining economically timed effects and which, in total, is higher than the initial expenditure. [12]

Investment leads to increasing and diversifying supply, creating new jobs and improving the quality of life, restoring ecological balance. So the goal of the investment is to earn income and profit, secure employment and tomorrow's safety.

The economic efficiency of the investments represents the relation between their economic outcomes and the investment effort [7]; but the gap between the moment of investment and the moment of obtaining the results has to be also taken into account.

Agriculture, tourism and manufacturing industry are sectors which contribute to a sustainable economic growth, so investments must to be attracted to these sectors, not to speculative sectors, like: real estate or retail. [10]

In Romania, agriculture is a basic branch of the national economy because it provides food for the population as well as raw materials for the consumer goods industry

The contribution of agriculture, forestry and fish farming to GDP in Romania is around 6% of GDP, while in the EU Member States it is around 1.7%. [9]

The level of life of a nation is in close dependence on food resources, quantitative and qualitative. [3]

Agriculture must ensure sufficient production for domestic consumption, and excess to be directed to export. This goal can be achieved through the development and modernization of agriculture through investments. [4,5]

Investment in agriculture ensure economic growth and labor productivity. [4,5]

The purpose of this paper is to determine the influence of agricultural investments on the Romanian agriculture incomes, realizing in the same time their evolution.

MATERIALS AND METHODS

The research was carried out on the basis of statistical data published by the National Institute of Statistics of Romania, taking into account a period of 13 years, respectively 2005-2017. The methods of analysis used for data processing were: the comparison method, the indices method, correlation method and regression method.
The indicators under study are represented by: agricultural investments and incomes obtained by farmers in agriculture.
The indices method shows the evolution of a phenomenon and highlights the annual growth rates. [12]
The comparison method highlights changes in time and space of events.
The correlation method highlights the degree of association between the variables. It is a general term used to define the interdependence or link between variables observed in statistical populations. In a narrow sense, it is a measure of the degree of statistical linkage between quantitative variables, called "correlation coefficient" [6]
The correlation coefficient is a composite indicator that measures the intensity of the connections between the variables, showing which share of the Y variation is a result of the influence of the X factor. [1]
The correlation ratio can take values between 0 and 1. If the value is close to 1, the link between the variables is stronger and less intense as they approach more than 0. The minus sign indicates the inverse link while the plus sign indicates the direct link. [2]
The correlation and regression calculation was made with the help of the statistical instrument in Excel, useful in the analysis, simulation and interpretation of results.

RESULTS AND DISCUSSIONS

In view of the important contribution of agriculture to Romania's GDP, it is essential to assess the investments in agriculture, as well as the incomes of people working in this field.
Analyzing the evolution of investments in agriculture during the analyzed period, we can see an upward trend until 2008, followed by a downward trend in 2009 and 2010, starting with 2011, the upward trend is coming.
The causes that led to the downward trend in 2008-2009 are due to the economic crisis, which was manifested at global level, but also in Romania. The decrease of investments in agriculture in 2009 compared to 2008 was 12.7% and 8.9% in 2010 compared to 2009. The highest increase can be seen in 2008 compared to 2007, respectively 52.6%. Compared to 2005, in 2015 investments increased by 255%. But there is a decrease of 8.2% in 2016 compared to 2015.

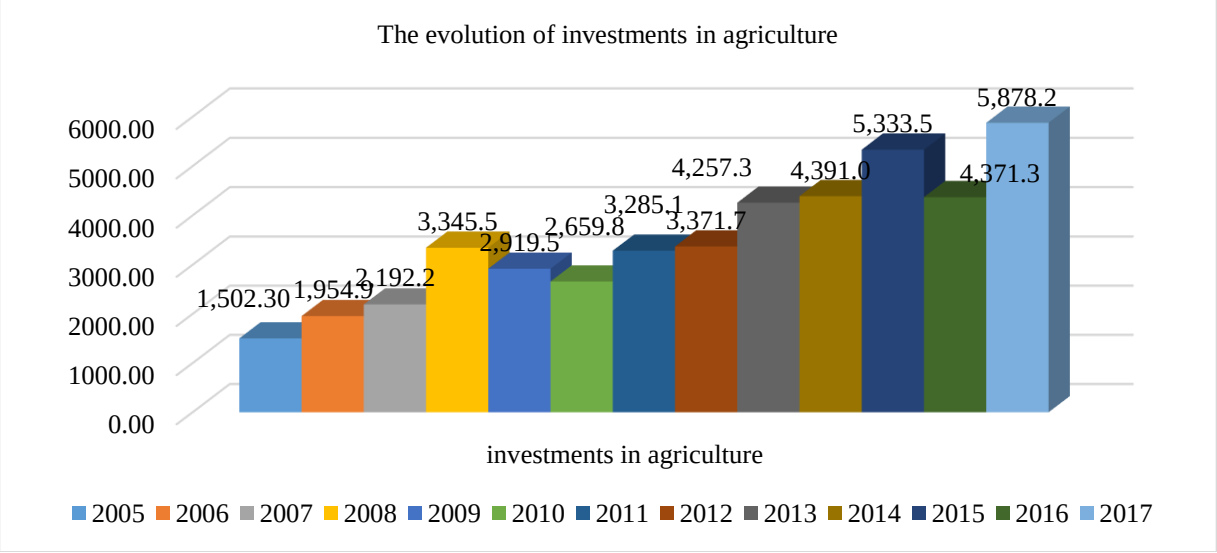


Fig.1. The evolution of investments in agriculture in the period 2005-2017
Source: NIS, http://statistici.insse.ro, Accessed on 4.03.2018 [11].

Attracting foreign direct investment to the area of agriculture can be a solution, especially for organic farming, given the growing demand for organic products. Because of the moderate use of chemical fertilizers in Romania, conversion to organic farming can be made to capitalize on its comparative advantages, namely agricultural land of high quality and productivity. [8]

Foreign direct investment can drive upgrading of agriculture and increasing yields by developing irrigation systems, equipping farms with modern machinery, and using fertilizers that are less harmful to the environment. Unfortunately, the experience of recent years shows that investments made in agricultural land have purely speculative purposes.

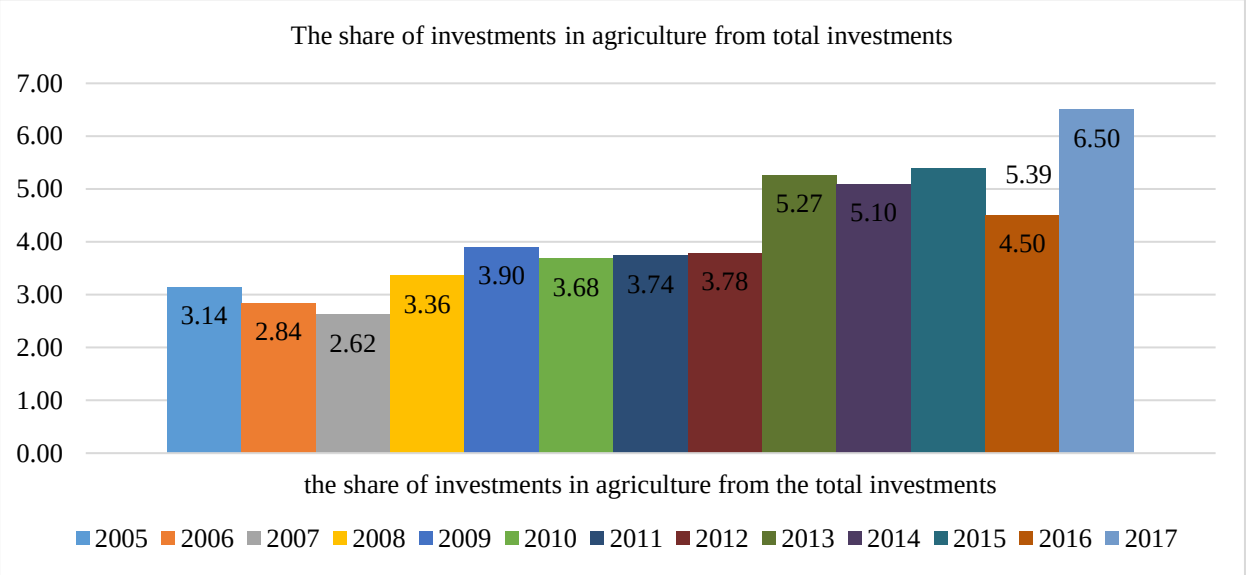


Fig.2. The share of investments in agriculture from total investments in 2005-2017 period
Source: NIS, http://statistici.insse.ro, Accessed on 4.03.2018 [11].

Analyzing the share of investments in agriculture from total investments in Romania according to the chart 2 it can be noticed that in 2007 the lowest share was recorded, respectively 2.6%. In the period 2010-2012 the share of investments in agriculture from the total investments was about 3.7%, and in 2017 the highest value is observed, namely 6.5%.

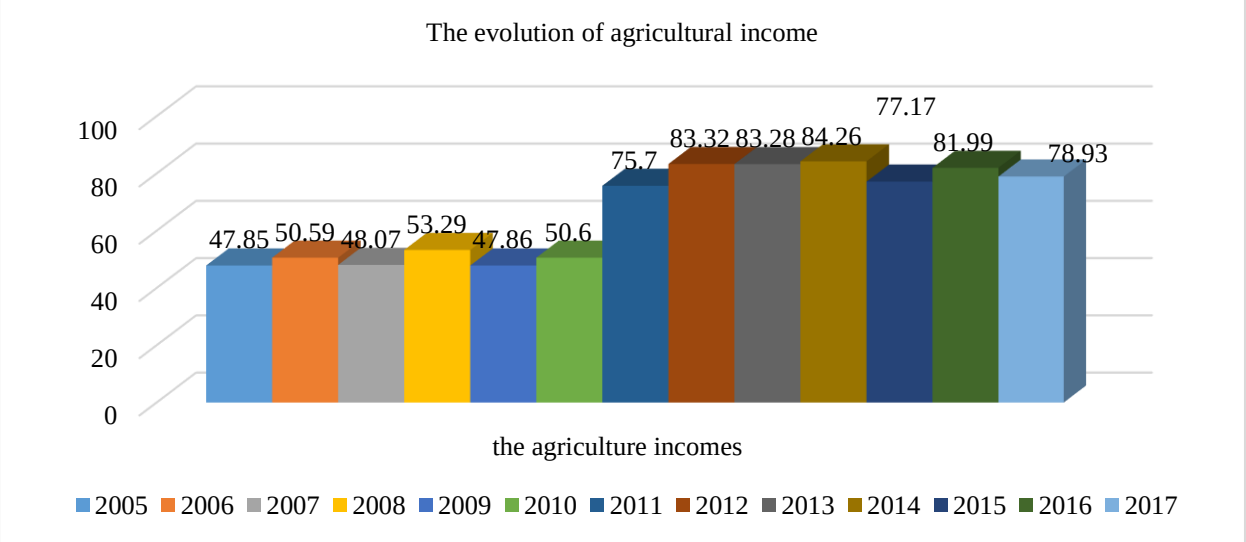


Fig.3. The evolution of agricultural income in 2005-2017 period
Source: NIS, http://statistici.insse.ro, Accessed on 4.03.2018 [11].

Analyzing farm incomes according to the Fig. 3 there is an upward trend until 2014, followed by a decline in 2015, a slight increase in 2016, followed by a fall in 2017. The amount of income in agriculture is very low compared to other areas.

Table 1.The results of the regression function between agricultural investment and agricultural income

Regression Statistics	
Multiple R	0.786369
R Square	0.618376
Adjusted R Square	0.583683
Standard Error	9.575483
Observations	13

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1,634.299	1,634.299	17.8242	0.001432
Residual	11	1,008.589	91.68988		
Total	12	2,642.888			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	36.81431	7.881851	4.67077	0.000682	19.46647	54.16215	19.46647	54.16215
X Variable 1	0.008959	0.002122	4.221872	0.001432	0.004288	0.013629	0.004288	0.013629

Source: Own calculations.

The competitiveness of Romanian agriculture is influenced by the imbalance between the large number of small farms compared to the large ones, which also influences the incomes obtained.

Because of the large number of small-sized farms, their ability to negotiate with large chain stores is very low, which leads to the appearance of intermediaries, which means low incomes for producers.

Based on the resulted data (Table 1), the connection between the value of investments in agriculture and the value of the incomes obtained from agriculture in Romania is a direct and high intensity, because the coefficient of correlation having a value of 0.786.

The value of the coefficient of determination indicates that 78% of the variation of the agricultural income is influenced by the volume of investments in agriculture.

Because F = 17.8242, and the probability (F - statistical) is 0.001432 (a lower value than 0.05), this model is valid, the calculated value of F test being higher than the theoretical one. With a direct and close connection between the two indicators, we can assume that an increase of 1 million lei in agricultural investments will lead to an increase in agricultural incomes by 89.50 lei.

CONCLUSIONS

Analyzing the evolution of investments in agriculture during the analyzed period, we can see an upward trend until 2008, followed by a downward trend in 2009 and 2010, starting with 2011, the upward trend is coming.

Attracting foreign direct investment to the area of agriculture can be a solution, especially for organic farming, given the growing demand for organic products.

Analyzing farm incomes there is an upward trend until 2014, followed by a decline in 2015, a slight increase in 2016, followed by a fall in 2017. The competitiveness of Romanian agriculture is influenced by the imbalance between the large number of small farms compared to the large ones, which also influences the incomes obtained.

The connection between the value of investments in agriculture and the value of the

incomes obtained from agriculture in Romania is a direct and high intensity. With a direct and close connection between the two indicators, we can assume that an increase of 1 million lei in agricultural investments will lead to an increase in agricultural incomes by 89.50 lei.

REFERENCES

[1]Anghelache, C., Badea, G. S., Capanu, I., Wagner, P., 2005, Tthe fundamentals of the theoretical and economical statitistics, Economic Publishing House. (Bazele statisticii teoretice și economice, Editura Economică), București, pp.135.
[2]Baron, T., Anghelache, C., Țițan, E., 1996, Statistics. Economic Publishing House (Statistică, Editura Economică), București, pp.154-157.
[3]Binswariger, H., Von Braun, J., 1993, Technological Change and Commercialization in Agriculture, in Lipton, M. and J. van der Gaag (editors), Including the Poor, Washington DC, The World Bank.
[4]Cicea, C., Subić, J., Turlea, C., 2010, Specific economic efficiency indicators of investments in agriculture, Journal Central European of Agriculture, Vol.11, No.3, 255-264.
[5]Cicea, C., Subić, J., Pirlogea, C., 2010, Considerations regarding investments efficiency in agriculture, Economia. Seria Management Vol.13, No. 2.
[6]Ene, D., Drăghici, M., Alecu, I., M., 2003, Statistics applied in agriculture, Ceres Publishing House (Statistică aplicată în agricultură, Editura Ceres), București, pp.80.
[7]Mecu, D. G., 2013, Factors influencing investments, Romanian Review of Statistics (Factorii care influențează investițiile, Revista Română de Statistică), pp.256-258.
[8]Milea, C., 2015, Foreign direct investments- A promotor or inhibitor driver of sustainable development (Investiţiile Străine Directe – Factor Promotor Sau Inhibitor Al Dezvoltării Durabile?) (October 8, 2015). The impact of socio-economic and technological chnages at the national Europeana and wordl level (Impactul transformărilor socio-economice și tehnologice la nivel national, european si mondial), Vol.7, No.7, https://ssrn.com/abstract=2671288 http://www.revistadestatistica.ro/Suplimente/2013/1_2013/srrs1_2013a35.pdf, Accessed on 11 March 2019.
[9]Ministry of Agriculture and Rural Development, www. madr.ro, Accessed on 11 March 2019
[10]Moraru, C., 2013, Foreign direct investments and economic growth in Romania, Academy of Economic Studies of Bucharest, Theoretical and applied Economy, (Investiţiile străine directe şi creşterea economică în România, Academia de Studii Economice din Bucureşti, Economie teoretică şi aplicată), Vol. XX, No. 5(582), 123-133.
[11]National Institute of Statistics, http://statistici.insse.ro, Accessed on 4 March 2019.
[12]Niculae, I., Costaiche, G. M., 2014, Technico-economic analysis, Ceres Publishing House, (Analiză tehnico-economică, Editura Ceres), București, pp.7.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

FINANCIAL DIAGNOSIS OF THE COMPANY BASED ON THE INFORMATION DERIVED FROM THE BALANCE SHEET. CASE STUDY

Daniela CREȚU, Andrei Radu IOVA, Mariana NĂSTASE

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania, Emails: danielacretu5@yahoo.com, andrei_anglia@yahoo.com

Corresponding author: danielacretu5@yahoo.com

Abstract

The role of the balance sheet in the financial diagnosis of the company derives from the fact that it serves to determine the financial security margin through the working capital, which allows the company to face the short-term risks, guaranteeing its solvency. Based on these considerations, we elaborated this paper based on the information gathered from a commercial company with an agricultural profile by emphasizing the balance indicators based on the financial balance, namely: the net working capital, the working capital requirement, the net treasury, the net situation of the company. The sources of information for this paper were the company annual financial and accounting statements for the period 2015-2017. As a method, the comparative financial analysis was used, more specifically, the analysis of the company results based on the company balance sheet. The positive and growing net position highlights a sound economic management as a result of reinvesting part of the net profit and other capital items.

Key words**:** *financial balance, working capital, profit, net situation, net treasury*

INTRODUCTION

In general terms, *the balance sheet* expresses the patrimonial situation at the end of the financial year. However, the accounting document that expresses how it reached the ultimate patrimonial situation, which were the income and expenses flows that marked the evolution of the enterprise between the beginning and the end of the financial year, represents the profit and loss account. The balance sheet is the brief accounting document which presents the assets and liabilities (means and resources) at the end of the year and in other situations stipulated by law, grouped by nature, destination and liquidity, respectively by nature, origin and exigibility (Coșea and Nastovici, 2007, Mironiuc, 2011) [3, 9]. The liabilities refer to the funds received by the enterprise (shareholders own funds, provisions, operating liabilities, financial liabilities), and those assets, the use of these funds on a durable basis (fixed assets) and on a temporary and cyclical basis (current assets).
Assets and liabilities reflect the same reality as means of financing and their use at the same time, which imposes the permanent balance between the assets and liabilities of the balance sheet, regardless of the form of presentation (table or list).
The agricultural company, as an independent economic and social body, has as main objective to obtain profit. By comparing the *effort* made by the company (company), measured by the accountancy by the amount of *expenses*, namely the consumption of factors in the exploitation process, with the obtained *effect*, measured by the accountancy by the size of the income, the *result* is obtained, which can be positive-profit or negative -loss.
In the market economy conditions, the efficiency of a company depends to a large extent on the managers' ability to understand and apply modern management principles, methods and techniques. The quality of the management act is a vital condition for the companies to gain competitive advantage and to resist to the competitive mechanisms. The statement is as important as in recent years it was demonstrated that the main factor of bankruptcy of a company is the managers' incompetence and the management mistakes

due to errors in decision-making. In a structural analysis, this factor has a share of 60%, followed by the unfavourable evolution of the market (with a share of 20%), natural phenomena, fire, disasters, earthquakes (with a share of 10%) and other causes (10%) (Ionescu, 2013) [7].
Considering that the bankruptcy comes as a result of the company failure to make its payment obligations and is determined by the lack of liquidity, we can state that the management of the financial activity is the cause of the entrepreneurs' success or failure. (Brezeanu, 2006, Pişleag, 2012) [2, 10].

MATERIALS AND METHODS

The sources of information for this paper were the annual financial and accounting statements of a company with agricultural profile in Ialomița county, for the period 2015-2017, with the components: the brief balance sheet, the profit and loss account, the accounting notes, the accounting policies of the company.
As a method, the financial analysis was used, more specifically, the analysis of the company results based on the company balance sheet. The analysis based on the financial balance sheet aims, above all, to highlight this balance state.
Analyzing the financial balance horizontally, it is considered that "maintaining the financial balance is achieved when the permanent resources finance the permanent uses and temporary resources finance the temporary uses" (Georgescu, 2009, Cretu, 2016) [5, 6].
Starting from a certain balance that must exist between the duration of a funded operation and the duration of the corresponding means of financing, the financial balance highlights two main funding rules, namely: permanent needs for the allocation of funds will be covered from permanent capital, in particular from own funds, temporary needs will normally be financed from temporary resources (Brezeanu, 2006, Pişleag, 2012) [2, 10].
Not complying with the funding rules, it will result in a financial imbalance which will either be a stress (pressure, discomfort) for the financial manager, who will be obliged to secure the financing of some assets that must be permanently available to the company from temporary liabilities, or too high of capital acquiring, given that, in principle, short-term capital presents a higher cost over the same time horizon.
Using specific methods and techniques, the financial diagnosis allows the evaluation of the past and present financial situation, based on information provided for making decisions bz the management team, it aims the future. The information needed to make the financial diagnosis is taken from the simplified financial situations which contain: the balance sheet, the profit and loss account, the explanatory notes.

RESULTS AND DISCUSSIONS

The two parts of the balance sheet, containing asset items in close relation with liabilities, reflect the long-term financial balance and the short-term financial balance.
The absolute indicators of the financial balance are: The Working capital (FR); The working capital need (NFR); Treasury (T), Net Situation (S.N.)
The company that provided the information for analysis was established in 2003 as a limited liability company; - is a Romanian legal entity, which develops its activity based on the Law 31/1990 on the establishment of the commercial companies.

Table 1. Structure of crops and evolution of grown surfaces, in the period 2015-2018

Crop	Grown surface -ha/ years			
	2015	2016	2017	2018
Wheat	103	91	86	80
Barley	35	47	43	49
Rape seed	167	204	139	129
Maize	72	35	60	100
Sunflower	41	41	90	60
Lucerne	2	2	2	2
Total	420	420	420	420

Source: Data from the company records.

The main activity of the company is: "Cereals growing (except for rice), leguminous plants and oil seed producing plants - CAEN code - 0111.

From the analysis of the crop structure and the evolution of the areas grown on crops (Table 1), it is noted that during the period 2015-2018, the structure of the crops remained the same as the agricultural area under use.

All crops are grown on fluctuating surfaces each year, as the management team aims to make crops more efficient by performing a rational rotation of crops.

The working capital is that part of the permanent capital intended and used to finance the current operating activity. In practice, when the permanent resources are larger than the permanent needs of money allocating, the enterprise has a working capital fund (International Standards of Financial Reporting, 2011) [8].

This first balance indicator represents all the resources needed to finance the company current activities, and can be calculated using as source the financial balance sheet as well as the functional balance.

The working capital can be calculated as follows:

FRN = Permanent Capital – Fixed assets

Within the studied company, during the studied period (Table 2, Figure 1), it can be noted that the working capital is negative, the decrease being 10.6% in 2017 compared to 2015. Each year, the permanent capital is located below the level of the fixed assets, both structures, compared per percent, record an increase of about 10% in 2017 compared to 2015.

Table 2. Evolution FRN, in the period 2015-2017

Specification	U.M	2015	2016	2017	Evolution indicators (%)
Permanent capital	thousand Lei	1,861.9	1,949.5	1.918,6	10.3%
Fixed assets	thousand Lei	3,345.6	3,461.4	3.469,9	10.4%
FRN	thousand Lei	-1,483.7	-1,511.9	-1.551,3	-10.6%

Source: Financial situations – accounting balance sheet.

From the solvency point of view, the company is under the impossibility to repay the short term debts, with a share of about 70% of total debts.

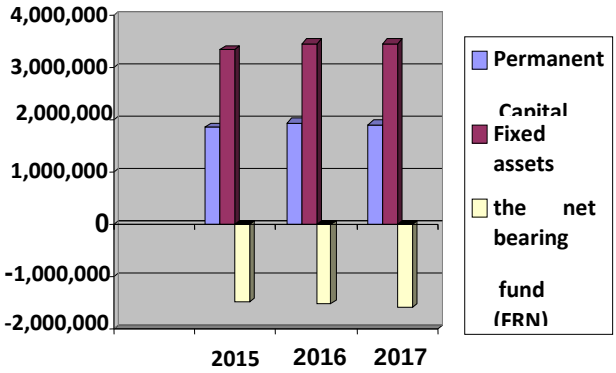


Fig. 1.Evolution of FRN, in the period 2015- 2017 (lei)
Source: Own design based on Balance sheet.

The financial working capital can be further analyzed, according to the structure of the permanent capital, an analysis that highlights the degree to which the financial balance is ensured through own capital. The indicator that reveals this degree of financial autonomy or freedom in making investment decisions regarding the development of the enterprise is its **own working capital** that is the surplus of own capital in relation to net fixed assets. (Pişleag, 2012, Cretu, 2017) [4, 10].

A negative own working capital should not be interpreted as an unfavourable situation, at least in the short term, but only a potential alarm signal for the future.

Starting from a certain balance that must exist between the temporary values and temporary resources, the balance sheet highlights another financial balance indicator named the need for working capital as an indicator of the need to finance the circulating asset.

The working capital need expresses a discrepancy between flows and can be determined as a difference between uses and resources, a difference corresponding to that part needed for the operating cycle that was not funded by the resources generated by this cycle and should be covered by complementary financing.

In other words, NFR represents the money to be run in the company to ensure its operation (after the assets financing), which claims costs that will be recovered when the invoices are paid by the customers.

The working capital requirement is determined as the difference between cyclical

allocations (current assets excluding liquidity: stocks and receivables) and cyclical sources (short-term debts: operating debts and treasury credits).

Further on, (Table 3, Figure 2) is the evolution of the elements that lead to the determination of the working capital requirement, namely the elements representing cyclic/temporary allocations compared to their cyclical/ temporary sources of financing.

The need for negative working capital indicates an unfavourable situation if it is the result of a temporary interruption in the supply and renewal of inventories of the stocks or in the production activity.

Table 3.Evolution of NFR, in the period 2015-2017

Specification	U.M.	2015	2016	2017
Stocks	Thousand Lei	901,5	942,2	936,5
Receivables	Thousand Lei	608,9	961,8	452,8
Advance costs	Thousand Lei	5,7	5,3	1,5
TOTAL CYCLIC ALLOCATIONS	Thousand Lei	**1,516.2**	**1,909.3**	**1,390.8**
Operating liabilities	Thousand Lei	1,730.8	1,856.1	2,198.3
Advance income	Thousand Lei	1,966.5	2,032.5	1,606.5
TOTAL CYCLIC SOURCES	Thousand Lei	**3,697.3**	**3,888.6**	**3.804.8**
NFR	Thousand Lei	-2,181.1	-1,979.3	-2.414.0

Source: Financial situations – Accounting balance sheet.

The negative value ***(NFR < 0)*** highlights the surplus of the temporary resources in relation to the corresponding needs of the working capital, or temporary needs less than the possible temporary sources of mobilization. Such a situation can be appreciated favourably, if it is the result of the acceleration of the rotation of the current assets and the simultaneous engagement of the debts under favourable conditions for the enterprise (with higher due), that is, the payments were accelerated and payments were diminished.

This is a frequent case in the enterprises with commercial activity, due to supplier loans - much larger than customer loans.

On the contrary, the need for negative working capital shows an unfavourable situation, due to temporary interruptions in the supply and renewal of inventories of stocks or in the production activity or in situations of non-observing the short-term debt pay off.

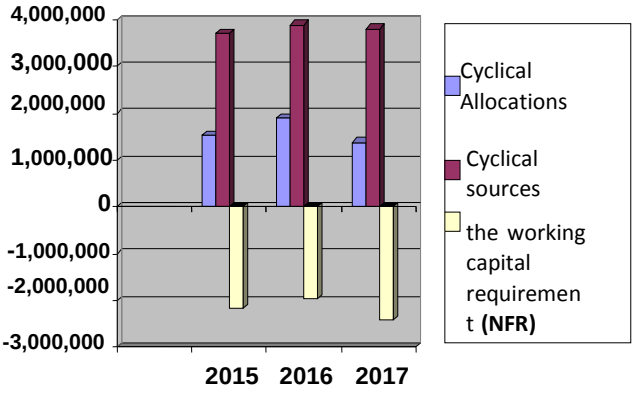


Fig 2.Evolution NFR, in the period 2015- 2017-lei
Source: Own design based on Balance sheet.

The Treasury represents the image of short-term money availability and short-term investments come from the current evolution of receipts and payments, respectively the placement of the monetary surplus.

The calculation of the net treasury leads to the confrontation of the working capital with the working capital need, from which the financial balance of the enterprise results and reflects the financial situation of the company both in the short and long term.

The net treasury is determined as the difference between the working capital and the working capital need: **TR = FRN– NFR.**

The positive difference between FRN and NFR highlights the availability of money in bank accounts and cashier accounts.

The reverse situation, namely the negative difference (negative treasury), shows that the company is in financial imbalance at the end of the accounting year, and for the continuation of the activity it has to turn to short-term bank loans.

For the analyzed company, the net treasury is determined by the difference between the working capital and the working capital need.

The net treasury (Table 4) during the analyzed years 2015-2017, decreased by -11.9 %, the highest value being recorded in 2017 by -

832,625 lei and the lowest in 2016 by -467,412 lei, which highlights the company dependence on the external financial resources and thus the company financial autonomy is limited in the short term because the amounts in the bank accounts and the cash office of the company cannot cover the amount of the current debts. This financial dependence should not be implicitly interpreted as a state of insolvency.

Table 4. Evolution of net treasury - TN, in the period 2015-2017

Specification	U.M.	2015	2016	2017	Evolution indicators (%)
FRN	thousand Lei	-1,483.7	-1,511.9	-1,581.2	-10.6%
NFR	Thousand Lei	-2,181,1	-1,979.3	-2,413.9	-11%
TR	thousand Lei	-697.4	-467.4	-832.7	-11.9%

Source: Financial situations – Accounting balance sheet.

The positive difference between the working capital and the working capital need highlights the availability of cash in the bank accounts and in cash accounts and the treasury is positive.

This favourable difference is found in **a treasury enrichment**, as the existence of liquidity allows the repayment of short-term financial debts as well as various efficient and safe placements in the money and/or capital market (Ionescu, 2013) [7]. It is even about **a short-term financial autonomy.**

Not always a positive treasury reflects a favorable situation, the long-term existence of cash availability may be an insufficient use of them.

Starting from the legal approach of the balance sheet, many financial analysts use the concept of net situation, estimating in accounting terms the value of the rights that the owners posses on the assets of the company (Coşea and Nastovici, 2007, Bătrâncea, 2007, Mironiuc, 2011) [1, 3, 9].

The net situation of the company is determined starting from the component elements of the asset (assets owned by the enterprise and receivables) and the liability balance sheet (own capital and debts). The net situation can be considered as a primary or preliminary indicator of carrying out a financial analysis, with the ability to reflect the management of the enterprise. The net situation can be calculated as the difference between total assets and total liabilities: **SN = A - D.**

It can be seen (Table 5, Figure 3) that in the period 2015-2017 there was an increase in total debts of 12.5%, which exceeded the percentage increase of the total asset, of 10.3% over the same period.

From the information presented, it results that within the company the net situation is positive over the three analyzed years, but decreasing by 14% in 2017 compared to 2015; this highlights sound economic management as a result of reinvesting part of the net profit and other capital items.

The increase in the net situation highlights the achievement of one of the objectives of the enterprise, namely maximizing its value.

Table 5. Evolution of net situation - S.N, in the period 2015-2017

Specification	U.M.	2015	2016	2017	Evolution indicators (%)
Total Asset	thousand lei	**5,559.3**	**5,838.2**	**5,723.4**	10.3%
Total debts	Thousand lei	**2,418.3**	**2,573.5**	**3,024.6**	12.5%
SN	thousand lei	3,141.0	3.264,7	2,698.8	-14%

Source: Financial situation – Accounting balance sheet

The net situation can be considered as a primary or preliminary indicator of carrying out a financial analysis, with the ability to reflect the management of the enterprise.

The net situation indicator expresses the asset value achievable at a certain time.

Owners, shareholders and creditors are interested in knowing the net situation of an enterprise. On the one hand, the shareholders and the owners of the enterprise want to know the value they own, and on the other hand, the creditors want to know the achievable asset that constitute the security of their receivables. The net situation illustrates the amounts to the partners or shareholders in case of liquidation.

A company has a positive financial position in case its own capital is higher or at least equal to the debts with economic value.
This condition shows the fact that the enterprise, as a matter of law, has the possibility to pay its obligations to third parties, both during its activity and at its liquidation.

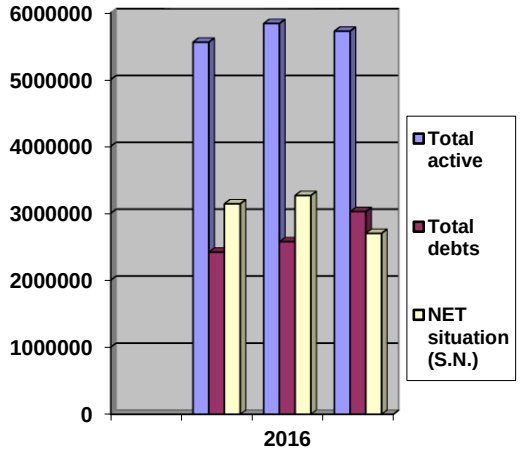


Fig. 3.Evolution of S.N., in the period 2015- 2017 (lei)

Following the determination and analysis of each indicator of financial balance we formulated the conclusions regarding the improvement of the activity in the field analyzed in the company.

CONCLUSIONS

The goal followed by the financial diagnosis based on the balance sheet is the continuous improvement of the activity of the agricultural company, because regardless of the size of a business and its stage of development, each manager needs to know the resources available, how to use them as efficiently as possible to achieve the desired results and which are the actions that bring it gain or loss, so that the right decisions can be made.
The negative working capital denotes a state of financial imbalance, which needs to be analyzed according to the specific of the company activity. This situation reflects the non-compliance with the financing principle, according to which the permanent needs are financed from permanent resources, because part of the temporary resources is used to finance the permanent needs.
We find out that NFR is negative during the entire analyzed period, which would require an urgent supply of the stocks in the following years, but taking into account that the company field of activity, which does not need a surplus of temporary stocks compared to temporary sources of financing, a *negative* value of NFR (stocks + receivables< operating debts) is good, because, even if the company has large debts, there are investments in value adding assets.
The net treasury during the analyzed years highlights the company dependence on the external financial resources and thus its short-term financial autonomy is limited, because the amounts existing in the bank accounts and in the cash office of the company cannot cover the value of the current debts. This financial dependence should not be implicitly interpreted as a state of insolvency.
The *positive* and growing net situation highlights a sound economic management as a result of reinvesting part of the net profit and other capital items. The increase of the net situation highlights the achievement of one of the objectives of the enterprise, namely maximizing its value.
The working capital, the working capital need, the net treasury, the net situation are minimal financial management elements that must be part of the information that the managers receive periodically, especially since the implications of these developments may be negative.

REFERENCES

[1]Bătrâncea, I., 2007, Financial analysis of the economic entity, Risoprint Publishing House, Cluj-Napoca, 53-57.
[2]Brezeanu, P., 2006, Financial analysis. Bucharest: Meteor Press, 112-116.
[3]Coşea, M., Nastovici, L., 2007, Risk evaluation, methods and techniques of analysis at micro and macroeconomic level, Lux Libris Publishing House, Braşov, 37-39.
[4]Cretu, D., Iova, R.A., 2017, Financial management of the company, Kovacev Publishing House, Silistra, Bulgaria, 97-102.
[5]Cretu, D., 2016, Financial accountancy, Agora, Publishing House, Călăraşi, 108-111.

[6]Georgescu, N., 2009, Analysis of the accounting balance sheet, Bucharest, the Economic Publishing House, 98-99.
[7]Ionescu, C., 2013, Financial information in the context of the accountancy internalization, the Economic Publishing House, 234-236.
[8]International Standards of Financial Reporting, 2011, Part A, CECCAR Publishing House, Bucharest, pp. A386, A404.
[9]Mironiuc, M., 2011, Financial analysis. Case study. Junimea Publishing House, Iaşi, 23-25.
[10]Pişleag A., 2012, Financial accountancy. Course in ID-IFR technology, FRM Publishing House, Bucharest pp..46.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

TECHNICAL, ECONOMIC AND LEGAL ASPECTS REGARDING THE IMPLEMENTATION OF HOLIDAY TICKETS

Romeo Cătălin CREȚU[1], Petrică ȘTEFAN[1], Ioan Iulian ALECU[1], Cătălin Constantin VOINEA-MIC[2], Iulian MUNTEAN[3]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Phone:+40213182564, Fax:+40213182888, Mobile:+40723567799, Emails:creturomeocatalin@yahoo.com, stefanmarian2004@yahoo.com, iulian_alecu_2000@yahoo.com, avocat_catalinvoinea@yahoo.com, iulianase128@gmail.com
[2]Lawyer House Bucharest
[3]Agrarian State University of Moldova, Chisinau, Republic of Moldova

Corresponding author: stefanmarian2004@yahoo.com

Abstract

Holiday tickets (or holiday vouchers) are value vouchers, similar to meal vouchers, which can be offered by employers to employees. They serve as a payment instrument for payment of tourist services/holidays exclusively in Romania, for the beneficiary and his/her family. Holiday vouchers are nominal and non-transferable, they are deductible and tax-free, both for the employer and for the employee. In this paper, we analyzed the legal framework for the issue and implementation of holiday vouchers, as well as economic issues related to the effects on the increase in the number of tourists and the revenues from tourism. At the same time, we analyzed the influence of introducing holiday vouchers on the decrease in unauthorized tourism in our country. To make these studies, we have used statistical data provided by The Ministry of Tourism, The National Institute of Statistics, „The Federation of Hotel Industry of Romania" (FIHR) and by „The National Association of Tourism Agencies" (ANAT). We also analyzed and interpreted a survey conducted by the Romanian Hoteliers Federation among tourists, employers, tour operators and travel agencies. According to the data, the granting of holiday allowances or holiday bonuses in the form of holiday vouchers of 1,450 RON between 1 July 2017 and 30 November 2018 allowed 1.2 million Romanians, employees of state institutions or companies in which the state is a sole or majority shareholder, to spend their holidays in the country. At the end of October 2018, the value of holiday vouchers increased to EUR 244 million, 8.4 times higher than in 2017.

Key words**:** *holiday tickets***,** *holiday vouchers, tourism, the legal framework*

INTRODUCTION

According to the Emergency Ordinance no. 8/2009 with the subsequent amendments and completions, holiday tickets (or holiday vouchers) are value vouchers, similar to meal vouchers, which can be offered by employers to employees. They serve as a payment instrument for payment of tourist services/holidays exclusively in Romania, for the beneficiary and his/her family.

Holiday tickets are nominal and non-transferable, they are deductible and tax-free both for the employer and for the employee.

What CAN you pay with holiday tickets?

• accommodation at any of the tourist units in Romania, classified by the Ministry of Tourism

•hotel restaurant and accommodation packages

• accommodation and treatment packages

• accommodation and transport packages

• accommodation and recreation packages

What CAN'T you pay with holiday tickets?

• accommodation/stays outside Romania

• airline and coach tickets outside Romania

• accommodation in units without tourist classification

• insurance [6].

Holiday tickets are valid for 1 year from the date of issue. Holiday tickets, both on paper and electronic support, are issued only by units that are authorized by The Ministry of Public Finance. The maximum amount that can be awarded to an employee is 1,450 RON. The nominal values allowed for holiday vouchers issued on paper are multiple of 50

RON, up to 100 RON, the maximum nominal value per voucher.
Each paper holiday voucher is valid only if it has the number under which it was assigned by the issuing entity and includes at least the following:
a)the issuer and its identification data
b)the nominal value of the holiday voucher
c)the employer and his identification data
d)the name, the surname and the personal numeric code of the employee who is entitled to use the holiday voucher
e)„the space intended for the registration of the period in which it was used and for the application of the stamp of the affiliated unit"
f)„the interdiction of the affiliated unit from paying the cash difference between the value of the holiday voucher and the value of the package to the holiday voucher users"
g)the validity period of the holiday voucher usage
h)the interdiction to use the holiday voucher in other places than in affiliated units
i)the visual identity elements of the tourism brand of Romania (Fig. 1).

Fig. 1. Example of a holiday ticket
Source: ANAT.

The maximum cumulative ceiling of the commission charged from the employer and the affiliated unit by the issuing entities is up to 1% of the value of the holiday voucher, which contains the mandatory minimum elements [10].

MATERIALS AND METHODS

In this paper, we analyzed the legal framework for the issue and implementation of holiday vouchers, as well as other economic issues related to the effects on the increase in the number of tourists and the revenues from tourism. At the same time, we analyzed the influence of introducing holiday tickets on the decrease in unauthorized tourism in our country. „In order to carry out these studies, we have used statistical data provided by The Ministry of Tourism, The National Institute of Statistics, The Federation of Hotel Industry of Romania (FIHR) and by The National Association of Tourism Agencies (ANAT)" [1].
We also analyzed and interpreted a survey conducted by the Romanian Hoteliers Federation among tourists, employers, tour operators and travel agencies [2].

RESULTS AND DISCUSSIONS

The granting of holiday allowances or holiday bonuses in the form of holiday vouchers of 1,450 RON between 1 July 2017 and 30 November 2018 allowed 1.2 million Romanians, employees of state institutions or companies in which the state is a sole or majority shareholder, to spend their holidays in the country.
At the end of October 2018, the value of holiday vouchers increased to EUR 243 million, 8.3 times higher than in 2017.
According to ANAT statistics, June remains the month with the highest value of vouchers issued in 2018, namely EUR 125 million.

Table 1. The effects of holiday vouchers implementation from tourists' point of view

Effects	Percentage
Rediscovering Romania as an exciting holiday destination	56.5%
Recovery of physical and intellectual energy	55.6%
Diminishing the psychological, physical and intellectual effects of fatigue	47%
Increasing work capacity/health	35.5%
Developing/Improving family relationships and balancing professional and family life	35.2%
Meeting social and cultural-educational needs	24.4%

Source: FIHR.

„According to The National Institute of Statistics, in the first half of 2018, the number of tourists increased by 4.2%. Another effect

of using vacation vouchers was the increase of 10% in unit authorization applications this year."

The analysis and interpretation of the survey conducted by the Romanian Hoteliers Federation among tourists, employers, tour operators and travel agencies show us a lot of interesting things [2].

Effects signaled by beneficiaries are presented in Table 1.

Effects signaled by employers are presented in Table 2.

Table 2. The effects of holiday vouchers implementation from the employers' point of view

Effects	Percenatage
Increasing employee motivation and loyalty to work	89.4%
Increasing employee productivity	38.2%
Increasing work capacity/health	27%
Reducing sick leave	26%
Increased efficiency	16%

Source: FIHR.

Effects signaled by tour operators are presented in Table 3.

Table 3. The effects of holiday vouchers implementation from tour operators' point of view

Effects	Percentage
Increasing customer numbers	78.5%
Growth in turnover	72.3%
Increasing the occupancy rate	72.2%
Development/Consolidation of the business	36.5%
Reducing tax evasion	21.9%

Source: FIHR.

- Effects signaled by travel agencies are presented in Table 4.

Table 4. The effects of holiday vouchers implementation from travel agencies' point of view

EFFECTS	PERCENT
Increasing customer numbers	88,3%
Growth in turnover	44,5%
Increasing the occupancy rate	39,6%),
Development/Consolidation of the business	33,2%),
Reducing tax evasion	31,7%).

Source: FIHR.

The effects of vacation vouchers on the state budget are the following ones:

•Direct Benefits: At an allocation of EUR 400 million, the State recovered direct benefits: 3.5% of revenue, 13.45% of the tax related to salaries, 7.5% of the other expenses and 12.53% from the tax on investments generated in tourism

•Indirect benefits: diminishing black work, diminishing tax evasion, increasing labor productivity (reducing absenteeism and medical leave), the tourism multiplier effect in complementary economic branches [2].

According to data centralized by the National Institute of Statistics, at the end of July 2018, „the number of accommodation establishments was 8,448 units, with 543 more than the same date of 2017. 2,820 of these were agro-tourism guest houses, 1,708 guest houses, 1,632 hotels, 696 villas, 534 bungalows, 319 hostels, 232 tourist cottages and motels and 278 other types of tourist accommodation structures. Comparing to 31 July 2017, higher increases were registered in agro-tourism guest houses (266 more), bungalows (98 more) and guest houses (42 more)"[3, 5].

43.2% of the total number of places in hotels „were in the 3-star hotels, 23.8% were in 2-star hotels, 26.9% were in 4-star hotels, 4.3% in 5-star hotels, 1.9% in 1-star hotels and 0.09% in no-star hotels. 52.2% of the hotels are rated 3 stars and 20.8% are 2 stars. Five-star hotels were 37, and 4-star hotels were 368. At the end of July 2018, there were 101 tourist accommodation establishments not classified as tourist accommodation units compared to 114 on the same date last year". [4]

Among the tourist accommodation establishments with tourist accommodation functions, 28.1% were in the mountain resorts, 18.3% were in Bucharest, 9.1% in the seaside resorts (except Constanta), 7% in the spa resorts and 3.4% in the Danube Delta (including Tulcea), and 34.1% were in other localities and tourist routes. [7]

Among the total number of existing tourist accommodation places, Constanta County owned 25%, Brasov county 8.5%, followed by Bucharest Municipality with 6.2%, Bihor county with 4%, Prahova county with 3.8% and Suceava County with 3.5%, etc.

The number of tourist accommodation places existing on 31 July 2018 was 353,302. „The most places, 196,701, were in hotels, followed by agro-touristic guest houses with 48,602 accommodation places, tourist guest houses with 35,802 accommodation places, tourist villas with 16,602 places, hostels with 14,202 places"[4].

In 2018 we had a summer season with up to 25% higher proceeds than last year, due to holiday vouchers. Lack of events and promotion, as well as lack of workforce, were the three minuses that would have affected the season greatly if we were not saved by the holiday vouchers. The Ministry of Tourism has not carried out any promotional activity and the local authorities do not know or have the capacity to promote.

Holiday vouchers covered other "minuses".

The Romanian seaside was not ready to receive 30% more tourists. We say this by referring to the local authorities and the Ministry. Total inertia, lack of efficiency, lack of coordination in the public sector and, in particular, of real dialogue with private operators, lack of continuity in the Strategy of the Danube Delta-Seaside Association, destination management organization that generated steady and planned increases in the number of Romanian tourists and foreigners in recent years. All these are minuses, but saved by the increase in holiday vouchers.

Holiday vouchers Encouraged Romanians to travel more in the country.

The increases planned under the Strategy of the Danube Delta-Seaside Association have been achieved. Increases were also made on the segment of foreign tourists, a goal achieved by the introduction of flights and new routes brought in the last three years. However, tourists consider "inadmissible" the absence of resort maps, "not even in Romanian", information materials, bus tickets, English information panels, a published event calendar, or brochures with information about what, where and when to visit [8].

After the months of June and July were very rainy, holiday vouchers have helped greatly both seaside and mountain resorts and spa resorts, as August is probably the best month of Romanian tourism since 1989. The introduction of holiday vouchers has encouraged Romanians to travel more in the country, to explore areas where they may not have come, and also many of those who did not go on holiday now took advantage of the free tickets and used them [4].

Holiday vouchers will contribute to a significant increase in the winter season as well.

Romania exports massively the workforce to the tourist facilities abroad and we are still discovered in all tourist areas in Romania, both in tourism and in HoReCa.

We had a very good season, especially because of holiday vouchers that brought a surplus of Romanian tourists in Prahova and that energized the tourism sector to a great extent. We noticed a good flow of tourists even in July, which was unusually rainy. We believe that granting holiday vouchers will contribute to a significant increase in the winter season as well [9].

An ascending trend is observed regarding the occupancy rate of Prahova County compared to 2017. Thus, although „the number of arrivals in the county increased very slightly, by up to 5%, compared to last year, the number of overnight stays increased by over 10% compared to the 2017 summer season".

The occupancy rate in the county in the season just ended was 100% on weekends, during the week there was an average occupancy rate in Sinaia of over 85%; Azuga and Busteni over 75% and in the premountain area (Câmpina and Breaza) over 70%.

The occupancy rate for Mamaia was 100%

The summer season of 2018 was one of the best seasons in the last 20 years, if not the best. A great role was played by holiday vouchers, which led many employees to choose Romania as a destination for holidays and especially the Romanian seaside during the season. Linked to the seaside, „the end of the 2018 summer season, September, is also the best end of the season in the last 15-20 years. For Mamaia, the occupancy rate was almost 100% until about September 10, but also for other resorts on the Black Sea was extremely high".

The tourism in Romania is on an upward trend, and vacation vouchers have contributed

significantly to this growth. From employees and employers to travel agencies, everyone is pleased with the holiday voucher system.

The Government will also grant vacation vouchers to the public in the next two years, 2019 and 2020, but at the same value set previously for 2017 and 2018, 1,450 RON.

Normally, employees in the budget system receive a holiday allowance at the level of a minimum gross national salary, which this year was 1,900 RON, and from 1 January 2019 it will exceed 2,000 RON.

This way, the Government postponed the upgrading of vouchers' value for two years, arguing that their „increase would lead to a significant negative impact on the state budget and implicitly on local budgets in the context of wage increases already produced, as well as the increase of the minimum wage in the economy".

Holiday vouchers have been a breath of oxygen for the Romanian tourism industry (Fig. 2).

Fig. 2. Example of a holiday ticket
Source: ANAT.

The number of accommodation units for which the classification from the tourism ministry has been increased has increased. Data so far show that there have been 15% more requests to the Ministry than in the same period last year. So, not only tourists have benefited from this measure but also hotel and guest house owners, so more and more entrepreneurs have trusted that they can invest in tourism, that this sector is profitable.

The rewards offered in holiday vouchers are exempt from the employer's and employee's contributions (CAS, health fund, unemployment, accident insurance, etc.). Thus, compared to the same amount of money, it provides employers an economy of approximately 40% of the allocated budget. At present, the maximum deductible value is 8,700 RON per year for each employee.

Below is an example of comparative calculation for various holiday reward values offered to an employee:

Table 5. The effects of implementing holiday vouchers from the point of view of travel agencies

The net amount of the holiday reward granted to an employee (RON)	Case A: reward in vacation vouchers Employer Cost (RON)	Case B: Reward in money Employer cost (RON)	Savings made by the employer Case B - Case A (RON)
1.000	1.000	1.477 = 1,000 net reward + 198 employee contributions + 279 employer contributions	477
2.000	2.000	2.954 = 2.000 net reward + 395 employee contributions + 559 employer contributions	954
3.000	3.000	4.431 = 3.000 net reward + 593 employee contributions + 838 employer contributions	1.431
8.700	8.700	12.849 = 8.700 net reward + 1.719 employee contributions + 2.430 employer contributions	4.149

Source: Own calculation

CONCLUSIONS

Conclusions about the benefits of holiday vouchers:

•Employee motivation

After using the vouchers, employees return to work more restful and motivated, ready to get involved and perform.

•Savings for the business

For the value of vacation vouchers, you get deductibility in the calculation of corporate income tax and exemption from employer and

employee contributions for the granted amounts. The difference from according vouchers in place of holiday money rewards is an important investment budget for your business.

•An additional argument in salary bargaining

Holiday tickets are both an employee-valued bonus and an efficient and manageable way to offer rewards, for the company.

•Team appraisal and an enviable work environment

The holidays are one of the most popular forms of pampering and relaxation. Now, this extra-wage benefit is more affordable due to tax benefits and will certainly make a difference in employee's attitude and outcomes.

REFERENCES

[1] ANAT – Statistics regarding the advantages of the holiday tickets (Statistici privind avantajele tichetelor de vacanta - 2018).

[2]Federation of Hotel Industry in Romania (FIHR)- Field survey on the advantages of the holiday tickets (Federatia Industriei Hoteliere din Romania (FIHR) – Sondaj privind avantajele tichetelor de vacanta - 2018).

[3]Hontus, A.C. 2016, The analysis of the touristic traffic-An integra; part of the territory planning of the tourism, Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development, Vol. 16(4), 159-170.

[4]Ministry of Tourism - State of the authorized units 2017-2018), (Ministerul Turismului – Situatia unitatilor autorizate 2017-2018).

[5]National Institute of Statistics- Statistics in Tourism 2017-2018 (INS – Statistici turism 2017-2018).

[6]Oficial Monitor of Romania- Emergency Ordinance No.8 from 2009 (Monitorul Oficial al Romaniei - Ordonanţa de Urgenţă nr. 8 din 2009).

[7]Pavel-Nedea, A., Dona, I., 2017, Assessment of the touristic Danube Delta by profile and motivation of tourists. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 17(3), 283-286.

[8]Popescu, A., 2018, Tourist arrivals concentration -A case study in Romania's central area, Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 18(3) 331-338.

[9]Tindeche, C., Marcuta, A.G., Hontus, A.C. 2018, Evolution of tourism in the world and national context, Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 18(1), 493-500.

[10]Toader, I., Mocuta, D. 2018, A study on agritourism services in Romania, Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 18(2), 475-482.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE ROLE OF SOCIAL ENTERPRISES IN RURAL COMMUNITY DEVELOPMENT

Petronela CRISTEA, Emilia DAN, Ion DONA

University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile:+40744 6474 10, Emails: petronela.cristea@yahoo.com, emilia_dan@ymail.com, ion_dona@yahoo.com

Corresponding author: petronela.cristea@yahoo.com

Abstract

The purpose of this research is to analyze how rural areas use social enterprises as a tool for enhancing progress across economic and social domains. Social economy has been given many definitions over time, but regardless of the discussed concept, the main purpose of "the third sector of the economy" is the same. The social economy has emerged from the need to find new and innovative solutions for social, economic or environmental problems of communities and to meet the needs of community members that are ignored or insufficiently covered by the private and public sectors. The methodology that led to this paper is represented by relevant studies in the analyzed field, the legislation in force and analysis made by the Romanian National Institute of Statistics. Social enterprises are considered to be the engine of local development, thus contributing to solving social and economic problems. The main benefits of these businesses are: increasing the level of social cohesion, creating jobs for disadvantaged people, improving the cooperation between community members and institutions, increasing the environment and life`s quality, emphasizing the Romanian traditions and handicrafts that are part of the country's culture, thus putting into the value the cultural potential specific to the area to which it belongs.

Key words**:** *economic growth, rural areas, rural development, social economy, social enterprises.*

INTRODUCTION

The social economy (also called "solidarity economy" or "third sector") has emerged from the need to find new and innovative solutions for social, economic or environmental problems of communities and to meet the needs of community members that are ignored or insufficiently covered by the private and public sectors.

Law no. 219/2015 [12], whose rules have been approved by GD 585/2016, is a law dedicated to the social economy. According to this law, the social economy is: „the assembly of independently organized activities in the public sector, whose purpose is to serve the general interest, the interests of a collectivity and / or personal non-patrimonial interests by increasing employment of persons belonging to the vulnerable groups and /or production and supply of goods, services and/or works to those people".

Rural social enterprises can play a key role in rural development.

Social enterprises are seen as actors who follow a social mission with entrepreneurial means and as drivers of social innovation [8].

In rural regions, social enterprises deliver services, provide common goods, train and educate people and offer jobs. By doing so, they count on the proximity, spirit of self-help, and mutual knowledge that characterizes social life in many rural regions [1], [5], [10].

Social enterprises are considered to be the engine of local development, thus contributing to solving social and economic problems. The main benefits of these businesses are:

-Increasing the level of social cohesion
-Creating jobs for disadvantaged people
-Improving the cooperation between community members and institutions
-Increasing the environment and life`s quality
-Emphasizing the Romanian traditions and handicrafts that are part of the country's culture, thus putting into the value the cultural potential specific to the area to which it belongs

The objective of this paper is to present and examine the role played by social economy entities in rural development in Romania.

MATERIALS AND METHODS

The research is based on various sources of information, such as relevant studies in the analyzed field, the legislation in force and analysis made by the Romanian National Institute of Statistics.

RESULTS AND DISCUSSIONS

Social enterprises have an important influence on the rural development process due to characteristics as follow:
-Social objectives;
-Limited distribution of profit;
Democratic governance;
-The decision-making process is a democratic one;
Autonomy [7]
According to the Law no. 1/2005, in Romania the most recognized types of social economy entities are: cooperative societies, associations and foundations and mutual credit unions [14].

Cooperatives

The cooperatives are a type of private economic agent, which is registered and operates under the Romanian Law no. 1/2005 [14].
According to Romanian Law no. 1/2005 the cooperative is „an autonomous association of individuals and/or legal entities formed to promote the economic, social and cultural interests of the cooperative members, being jointly owned and democratically controlled by its members in accordance with the cooperative principles."
In accordance with Romanian Law no. 1/2005, the basic principles of the cooperative are:
(i)The principle of voluntary and open association: according to this priciple the cooperatives are volunteer entities, in which all people can join without any type of discrimination;
(ii)The principle of democratic membership control: cooperatives` members participate democratically in policy-making and decision-making;
(iii)The principle of members' economic participation: all cooperatives` members participate in the foundation of the entity and they will receive, in proportion to the participation share, a profit compensation. All of them allocate from the company's net profit for the development of the entity;
(iv)The principle of autonomy and independence: cooperative societies rely on the input and control of its members, being autonomous societies.
(v)The principle of education, training and information: cooperatives` members are provided with training and education by the companies they belong to, and they will contribute through the knowledge gained in the development of the societies;
(vi)The principle of cooperation between cooperatives: cooperatives work together for cooperative movement;
(vii)The principle of concern for the community: according to this principle, cooperatives act for the sustainable development of the communities they are part of.
The most recognised forms of the cooperative are represented by [4]:
-Consumer cooperatives
-Credit cooperatives
-Agricultural cooperatives
-Craft cooperatives
As can be seen from the diagram below, the most common types are consumer cooperatives.

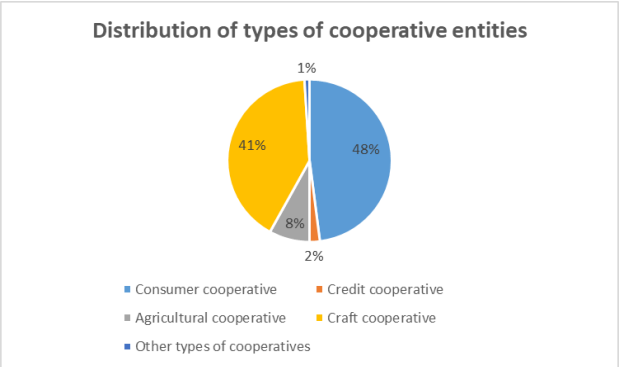


Figure 1. Distribution of types of cooperative entities
Source: ICA & Euricse, The 2014 World Co-Operative Monitor.

Consumer Cooperatives

The main aim of consumer cooperatives is to provide goods or services to members at the best prices. Their members are the consumers themselves, which associated to, could have access to products at the lowest possible price. Obtaining the lowest price as possible is obtained by eliminating fees charged by intermediaries.

Credit Cooperatives

In Romania, the first forms of credit co-operatives emerged in 1851, and had a constant development especially after 1990. The cooperative system has its own mechanisms of assistance among cooperatives, called the Central Credit Cooperatives Body (”Casa Centrala a Cooperativelor de Credit”). It represents the credit institution constituted by the association of credit cooperatives in order to manage their common interests, centralized overlook of legal provisions and framework regulations applicable to all affiliated credit cooperatives through the exercise of supervision and administrative, technical and financial control on their organization and functioning.

The network has a predominantly rural lending activity: 58.8% of the total loans vere given to rural individuals at the end of 2009. The arrangement of units especially in small towns and rural areas is aimed at approaching low-income and medium-sized customers and agricultural producers to whom credit co-operative organizations want to offer a wide range of products from paying different types of invoices to lending and saving their savings.

Agricultural Cooperatives

According to Romanian law no. 21/2019 [13], amending and completing the Law on Agricultural Co-operation no. 566/2004, "the agricultural cooperative is an autonomous association with an unlimited number of members, with variable capital, exercising an economic, technical and social activity in the private interest of its members".

Considering that in rural areas, agriculture is the main source of income and the main occupation, agricultural cooperatives are an important factor in supporting both agriculture and marginalized groups.

The main role of these entities is the creation of jobs and the implementation of viable business models in the context of economic fluctuation.

They also support manufacturers in legal terms and in decision-making.

Small agricultural holdings are preserving the economic, gastronomic, cultural and patrimonial traditions, these being attributes that define the national, local, regional Romanian rural identity.

They also provide stability for agriculture and contribute to ensuring overall food security and poverty reduction.

Agricultural cooperatives contribute to improving the productivity of small-scale agricultural holdings and enable access to product marketing, cost savings, credit, insurance and technology. Agricultural cooperatives serve as bridges between farmers and markets by aggregating products, facilitating the adoption of new technologies and raw material input.

They also help increase food production, diversify crops, and provide small-scale producers with a communications network that facilitates decision-making that influence their activities.

Between 2010 and 2012, were recorded the following increases:

-number of agricultural cooperatives –increase of 180%

-assets - increase of 153%

-revenues - increase of 164%

-number of employees - increase of 10%.

In addition, there was a positive perception of association among farmers, especially young people.

A survey conducted in January 2014 by the Romanian Center for European Policies shows that out of the 100 questioned young people, 64% intend to join in the next two years.

In order to support small farmers, measures and forms of additional dedicated support have been introduced in the new National Rural Development Program [11], having a family farm base, all of which aim to support the development of small producers.

In Romania are set up approximately 750 agricultural cooperatives, distributed according to the table below.

Table 1. Number of agricultural cooperatives

District	No	District	No	District	No
Botosani	104	Ialomita	19	Bacau	9
Constanta	34	Bistrita-Nasaud	18	Braila	9
Brasov	32	Olt	18	Iasi	9
Cluj	30	Caras-Severin	16	Valcea	9
Teleorman	30	Timis	16	Galati	8
Vrancea	28	Alba	15	Neamt	8
Calarasi	27	Buzau	15	Arges	7
Dambovita	27	Ilfov	14	Covasna	7
Suceava	27	Prahova	14	Giurgiu	7
Satu Mare	25	Vaslui	14	Hunedoara	6
Dolj	21	Salaj	13	Mehedinti	6
Harghita	20	Maramures	12	Sibiu	4
Arad	19	Bucuresti	11	Gorj	3
Bihor	19	Mures	10	Tulcea	3

Source: National Trade Register Office, Statistics of agricultural cooperatives in Romania in early 2015

The table shows us that most agricultural cooperatives which are operating in the North-Eastern Region.

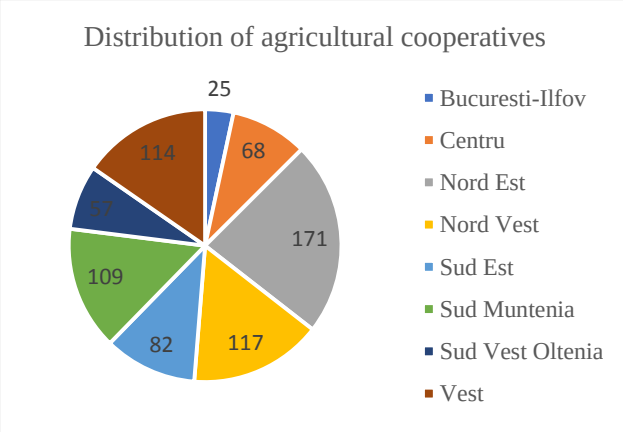


Figure 2. Distribution of agricultural cooperatives
Source: National Trade Register Office, Statistics of agricultural cooperatives in Romania in early 2015

Craft Cooperatives

According to Law no. 1/2015, cooperative craft societies are associations of individuals who jointly carry out production, merchandise, works and service activities which contribute directly or indirectly to the development of the craft activities of their cooperative members;

The key benefit of this type of cooperative is that it provides decent jobs especially for people from disadvantaged categories, by creating products of low complexity in specially organized units. They also play an important role in promoting and disseminating Romanian folk art and artistic crafts in the world through products that incorporate the country's specific tradition.

Table 2.Number of cooperatives by location and types

Location Type	Urban	561
	Rural	1,215
Cooperative Type	Consumer cooperative	782
	Credit cooperative	711
	Agricultural cooperative	96
	Craft cooperative	161
	Other types of cooperatives	23

Source: personal interpretation of information provided by NIS

Summarizing the above mentioned, one can conclude that this type of entity is an important piece of the rural development precess, providing small manufacturers with access to product marketing, savings, credit, insurance, and technology. Moreover, in order to support small producers, cooperatives are given priority in altering European grants. For example, dedicated support measures have been introduced in the National Rural Development Program to finance the development of small producers.

Associations and foundations

Ordinance no. 26/2000 stipulates that the associations and foundations can perform economic activities by creating and commercial company or directly. In case a commercial company is established, the profit obtained must be reinvested in the same company. After the 1989 revolution the NGOs expanded rapidly but the increase was not as significant as that of the credit cooperatives. [2]

The NGOs is the most developed field of the third sector as per the number of entities and employees.

Associations and foundations represent the biggest category of social economy entities in Romania, however in 2012 only 12 % (4,058) of these performed economic activities. The sector with the highest share of economically

active organizations in 2012 was forestry (51% of total associations and foundations operated in this sector, followed by agriculture (31%) and professional (12%).

According to Lumbru M. [6] , the NGOs are active in a wide range of fields like environment, social, human rights etc and the most important sectors are education and those related to social field.

NGOs have an important role in the communities where they activate, especially for the disadvantaged people – children, elderly, people with disabilities and Roma people.

Services supplied by these organizations are adapted to the groups needs and facilitate the social integration process – educational and social services, cultural and recreational services, environmental protection services, etc.

Moreover, the local community is participate in these activities with various resources and get involved in the development process – volunteers, materials, logistics, sponsorships or donations, etc.

In terms of areas of activities, most of the existing NGOs are caring out their activity in urban areas. There are few NGOs that are present and operate in rural areas (only around 20%) and are represented mainly by agricultural associations and mutual societies. [3]

In terms of self-sustenance and development of activities in favor of the disadvantaged groups, the NGOs may represent one major actor for the growth of the Romanian social economy sector [9].

Mutual credit organizations

The mutual aid units are a specific category of non-profit organizations operating based on the legislation represented by Ordinance no.26/2000 related to associations and foundations.

These structures have as purpose to support and assist their members by granting loans at low interest rates. In addition, the mutual aid units for the pensioners provide related social, cultural and touristic activities.

Lumbru M. in her study about Trends and Challenges for Social Enterprises in Romania, states that in Romania, the majority of mutual associations are Employee Mutual – help Associations (Credit Unions for Employees-CARS), Pensioners Mutual-help Associations (Credit Unions for Pensioners – CARP), each type of mutual organization having also a specific legislation. For the CARS, we have Law 122/1996 and, for CARP, Law 540/2002, which provides the legal operation framework for these organizations with double registration, giving a description of the types of activities that can be carried out by these mutual associations. Also CARS and CARP are registered as nonbanking financial institutions with the Romanian National Bank. [6].

The CARS offer loans with low interest for the members and are to be found with a higher frequency in urban areas and less in the rural areas.

With respect to the CARP, certain activities performed may generate income and from that income the pensioner are offered help for different purchases like glasses and treatments.

These entities have an influence on the development of the local community by offering loans to the members for certain activities, members that in most cases are persons with modest or low income. [7]

Accredited protected units

Another form of social enterprises are the accredited protected units. According to Law no. 448/2006 regarding the protection of the disabled people rights, republished, with the subsequent changes and completions, an accredited protected unit is defined as public or private economic operator, that administrate its own financial resources and at least 30% of the employees are people with disabilities (Law no. 448/2006 with regard to the protection and promotion of persons with disabilities, enacted by the Parliament on 03 January 2008).

According to the same normative act, the accredited protected units can be of two types: (a) with legal personality and (b) without legal personality. Those without legal personality administrate their own financial resources, in the form of workshops, sections or other structures part of economic operators, public institutions or nongovernmental

organizations, as well as those set up by an authorized disabled person, under the legal framework, to run independent economic activities (Law no. 448/2006 regarding the protection of the rights of the disabled people).

In the context of social economy sector, accredited protected units are extremely relevant due to the fact that they provide a good representation of both social and economic objectives in the same time by creating the possibility for socio-professional (re)integration of the disabled people.

CONCLUSIONS

Currently, the associative structures are to become future lead actor for socio-economic development of the Romanian rural areas, where all citizens and other stakeholders should become active with the opportunity to develop, inform, and critically analyze the social, economic and political and develop their skills
into action.

The main challenges are represented by the slow process, various resources needed to encourage, support and sustain participation, and sometimes requirements related to changes in the balance of power at the local level.

In general, the benefits of participatory approaches directly and genuinely involve local citizens (which may turn also the risk of loss otherwise) are:

-Efficient use of existing resources in a responsible way (in fact, an opportunity for local authorities, not citizen involvement from the initial project phase high risk that the community will not take the responsibility of project results, development projects are more probably perceived to belong to their originators - mostly local public administration - which represents a loss of opportunity for the local authority to transfer responsibility to the community);

-Effectiveness in the sense of legitimacy (lack of legitimacy the difficulties in implementation, community members likely will not support projects that are not real solutions for their needs as they perceive them, even if they will support the phase implementation, they probably will not support them in the use phase results);

-Using local resources helps to avoid dependence on external solutions (community should not depend on the outside, but instead of being able to identify solutions based on local resources, office support depends on community members who are responsible for their own solutions to the needs them);

-Human resource development (human capital is itself a community development engine before any other factors, capital of a community is the capital of trust and reciprocity, which is the main resource of rural communities)

-Balancing power relations between different sections of the community (otherwise deepens inequity between different socio-economic category);

-Control the process of local development, empowerment, ownership, continuity and sustainability.

REFERENCES

[1]Atterton, J., 2007, The Strength of weak ties: social networking by business owners in the Highlands and Islands of Scotland. Sociolgia Ruralis, 47, 228-245.

[2]Cace, C., Cace, S., Cojocaru, Ş., Sfetcu, C., 2013, Social Economy In Romania – Challenges And Perspectives, Transylvanian Review Of Administrative Sciences, No. 40 E/2013, 5-21.

[3]Cristea, P., 2017, The Social Economy In Romania And The Impact Of Non-Reimbursable European Funds Over This Sector Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 17, Issue 2, 75-80.

[4]Dobre-Baron, O., 2015, The Structure of the cooperative system within the contemporary market economy Annals of the „Constatntin Brâncuşi" University of Târgu Jiu, Economy Series, Issue 6.

[5]Jack, S.L., Anderson, A.R., 2002, The effects of embeddedness on the entrepreneurial process. J. Bus. Ventur. 17, 467-487.

[6]Lumbru, M., Petrescu, C., 2012, Trends and Challenges for Social Enterprises in Romania, Volume 2, Issue 2, June 2012, 163-182.

[7]Petrescu, C., Stănilă, G., 2012, The Impact Of Social Enterprises On Local Development, Calitatea Vieţii, Xxiii, Nr. 4, 2012, 345-360.

[8]Schöning, M., 2013, Social entrepreneurs as main drivers of social innovation. In: Osburg, T.,

Schmidpeter, R. (Eds.). Social Innovation. Springer, Berlin, 111-118.
[9]Stănescu, S., Cace S., 2012, Oferta de economie socială în Regiunile de dezvoltare Bucureşti-Ilfov şi Sud-Est, Bucharest: Editura Expert, 252
[10]Steinerowski, A., Steinerowska-Streb, I., 2012, Can social enterprise contribute to creating sustainable rural communities? Using the lens of structuration theory to analyse the emergence of rural social enterprise. In: Local Economy, vol. 27, 167-182.
[11]The Government of Romania, 2005, National Development Plan for 2007-2010.
[12] The Government of Romania, Law no. 219/2015 – Social Economy Law.
[13]The Government of Romania, Law no. 21/2019 – Agricultural Cooperatives Law.
[14] The Government of Romania, Law no. 1/2015 – Regarding the organization and functioning of the Cooperatives

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

CONCEPTUAL APPROACHES REGARDING THE ROMANIAN RURAL AREA

Eduard Alexandru DUMITRU, Marius Mihai MICU, Valentina Constanța TUDOR

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile:+40744 6474 10, Emails: dumitru.eduard.alexandru@gmail.com, micumariusmihai@yahoo.com, valentina_tudor@yahoo.com

Corresponding author: dumitru.eduard.alexandru@gmail.com

Abstract

This paper aims at defining the concept of "rural space" in Romania, as well as the way it is defined by the European Union regulations. This has been done by consulting works with a special role on the knowledge of rural space, both locally and at European level. At the current level, among the most important issues debated at European level, it concerns the protection of nature and the preservation and protection of cultural values and heritage. At the same time, the acute problems faced by the "Romanian village" tend to worsen, and among the main causes are the migration of rural population to large urban centers or to other more developed countries, due to unsatisfactory living conditions.

Key words**:** *rural development, conceptual approaches, rural space*

INTRODUCTION

Even though the second National Rural Development Program will be completed in 2020, the situation of the Romanian rural area does not seem to be much changed, so the main problems still persist. Characterized by an aging of population, as well as an exodus of young people to urban centers or to European Union countries, they all seem to have no solution. [5]

Young people who should have been the main "engine" of rural space are increasingly choosing to move away from rural areas because of the problems they face such as lack of jobs, low living standards, poor infrastructure lack of utilities, dispensaries, schools all of them are just some of the problems encountered in the Romanian rural area. [4] [9]

At the same time, societal changes, where more and more people choose to procreate at older ages, only after they have stabilized financially and professionally, make the number of family members lower, affecting so the number of the population, where more often than not, the number of annual deaths exceeds that of newborns, thus the population descended. [13]

Also, the traditional family as a whole has undergone certain changes over the ages, so the age at which people get married has grown and the number of marriages has fallen, this affecting demographically rural space.

Functions of rural space [1] [2]

The multitude of economic, social or cultural activities carried out can be grouped into three functions:

(i)Economic function - which aims to obtain agricultural products and other goods made on the branch of agriculture, forestry, crafts, etc. with the objective of ensuring satisfactory living conditions for people in rural areas.

Bold I. affirms that the economic function is a complex function, involving multiple activities, so that rural space is no longer seen as an agricultural area but a diversified one with different implications, from the use of agricultural workforce to maintaining youth through non-agricultural activities, generating additional income for the rural population. [3]

The ecological function - through the industrialization of some rural areas, through the mining activities, the industrialization of animal husbandry has resulted in the phenomenon of "pollution of rural space", degrading the agricultural and forestry

landscape and the reduction of flora and fauna.

The European Charter has set out a number of issues that the countries of the European Union have to take into account, such as:

-rational and sustainable exploitation of natural resources and preserving biodiversity,

-protecting the landscape,

-protecting the beauty and peculiarities of rural space,

-registration of places where old or breed farm animals are present, traditional rural landscapes, traditional farming techniques.

(iii)The social-cultural function - a function that is related to the relations within the communities and the inter-communitarian ones in the rural area, having a social character. Due to the small size of localities, specific relations are established between its members, based on mutual knowledge or social hierarchy.It is noted that some traditions found in rural areas have disappeared as a result of "modernization", yet still a rich cultural heritage.

The European Charter provides for this, acting in the following directions:

-inventorying, capitalizing and promoting historical and cultural heritage;

-designing and developing traditions and forms of cultural expression;

-strengthening the regional cultural identity of rural populations;

-promoting of rural and local gastronomic heritage.

Due to the diversification of the economic structure, the villages became in time mixed type settlements, classified as:

Scattered (scattered) villages are the simplest, usually isolated settlements, where people have a perfect adaptation to the natural environment.

Households are dispersed on the slopes, and the connection between them is through paths and paths. Basic occupations include animal husbandry and extensive cultivation of alpine pastures and pastures [11] [17].

Spent villages are considered to be a type of transition from excessive scattering to the gathered one, and may have a linear (peculiar to peak), areolar (encountered in most areas of the country) or alveolar type.

Gathered villages represent a gathering of households, especially in the plain areas, characterized by areas with intensive agricultural economies and "born" either by the desire to save the agricultural space or by the popular actions of some regions.

The villages with the structure are distinguished in several subtitles, such as: compact, conglomerate or actual villages.

The Romanian rural settlements are very diverse, their typology being influenced in time by the existing historical conditions.

At European level rural regions are classified according to:[15]

(a)NUTS typology (Nomenclature of Territorial Units of Statistics)

The region term used at the level of the European Union is defined according to its administrative policy and administrative formalities, so in Germany or Austria these are called Länder, Autonomous Communities in Spain, Regions or Communities in Belgium, Regions and Departments in France, county councils in Sweden or the UK, Autonomous provinces in Italy or provinces in Belgium, Denmark Italy, the Netherlands.

NUTS collects information, being classified on 5 levels, from highest to lowest, and the differences between levels 1-3 are based on demographic thresholds: [15]

-NUTS level 0 defines the Member States of the European Union;

-NUTS level 1 comprises 77 regions such as regions in countries such as Belgium or Germany.

-NUTS level 2 covers regions such as provinces in Belgium, peripherals in Greece, Länder in Austria.

-NUTS level 3 comprises more than 100 classified regions, for example, as offices in Belgium.

-NUTS level 5 includes municipalities or communes.

Table 1. Demographic Thresholds for NUTS Establishment

Level	Minimum (persons)	Maximum (persons)
NUTS 1	3,000,000	7,000,000
NUTS 2	800,000	3,000,000
NUTS 3	150,000	800,000

Source: Regulation (EC) No 1059/2003 establishing a common classification of territorial units for statistics (NUTS)

(b)OECD typology

The OECD, known as the Organization for Economic Co-operation and Development, has developed a defining rural area, following the conditions and trends in rural areas. Thus OECD defines rural areas in and communities with a population that has a density of less than 150 inhabitants/km². [15]

(c)Geographical classification [15]

Another typology of rural space is geographically geared and follows:

-Coastal areas and islands;
-Mountain areas;
-Periurban area;
-Low density area;
-The rest of rural areas.

We can observe that the first subheadings refer to geographic aspects, while the others refer to the content of these areas.

(d)Qualitative classification of rural space [15]

An important method of classifying rural areas, which according to the European Union admits 3 problematic standards:

-Areas that suffer from the pressures of modern life;
-Areas affected by rural decline;
-Very remote, low population areas.

Also, depending on their degree of integration into the national economy, rural areas can be classified as integrated, intermediate or remote areas.

At the level of the European Union, a series of priorities have been developed for the 2014-202 programming period [15]:

-Priority 1 - Transfer of knowledge and innovation (agriculture, rural areas)
-Priority 2 - Farm viability and competitiveness promoting innovative and sustainable technologies
-Priority 3 - Organizing the food chain by promoting its organization, also targeting the processing and marketing of agricultural products.
-Priority 4 - Consolidating ecosystems by restoring, preserving ecosystems in the field of agriculture and forestry.
-Priority 5 - Efficiency of resources by promoting them in order to rely on a low-carbon economy.
-Priority 6 - Balanced territorial development through the promotion of social inclusion and the economic development of rural areas.

MATERIALS AND METHODS

In the present paper, a series of European books, European regulations and relevant works concerning the European and Romanian rural areas were analyzed and consulted, identifying the notions of rural space, rural development, specific features and structures of rural space, taking into account the functions of rural space.

At present, the indicators on the evolution of the rural population and especially the South-Muntenia region have been analyzed using the data retained on the website of the National Institute of Statistics.

In order to estimate the evolution of the population by 2047 (30 years), the vensim modelling program was used.

RESULTS AND DISCUSSIONS

Rural space is a very complex concept, complexity that has generated a multitude of views on definition, scope and its components. After Dona I. "rural space can be defined according to the notions that characterize it, it encompassing everything that is not urban."

In the literature, there are many definitions and descriptions of rural space, however, in Council of Europe Recommendation No.1296/1996, as far as the European Charter is concerned, rural areas are defined as "the inner or coastal zone containing the villages and small towns, where most of the land is used for: [14]

-agriculture, forestry, aquaculture and fishing;
-the economic and cultural activities of the inhabitants of these areas (crafts, industry, services, etc);
-the arrangement of non-urban areas for leisure and recreation (or nature reserves);
-other uses (except residential). "

According to Bold *et al* (2003), the rural "comprises all activities that take place outside the urban area and comprises three essential components: administrative

communities made up of relatively few members and having mutual relations; the pronounced dispersal of population and collective services; the special economic role of agriculture and forestry"[3].

Of course, many definitions can be given and multiple descriptions of rural areas can be made. The notion of rural space has been extremely debated, each author having his own contribution. Perhaps the most simplified definition is where rural space is considered "all that is not urban", creating a confusion between the notion of rural and agricultural.

At the level of 2018, out of the total of 19.53 million inhabitants, representing the resident population of Romania, 10.50 million (53.8%) are found in the urban area, while just over 9 million inhabitants found in rural areas (46.2%). Noteworthy that the rural population registered a downward trend, so that if in 2012 they reached more than 9.24 million inhabitants, in 2018 this was 9.02 million inhabitants, so a decrease of about 2.3 %.

According to Bold *et al* (2003) [3], the specific characteristics of the rural area are:

-Agricultural activities account for the largest share of economic activity;

-Primary production sectors have the highest share in terms of occupational structure.

-The form of private property is the predominant;

-One of the main characteristics of rural areas is the low population density and the fact that the settlements are airy;

-The rural area is incomparably more beautiful due to the natural structure, determined by the flora and fauna found;

-Life in rural areas is determined by the experience of life, traditions and customs, but also by local culture;

-Non-agricultural activities usually complement agricultural activities.

Thus, it is appreciated that there can be no sign of equality between the rural and the rustic, because also in the rural area the laws of the progress that impose an evolution in the life of the people from the rural space act.

Dona I. highlights another characteristic of rural space in that "the environment is much less polluted than in the urban environment" [6] [7].

Periurban rural area is defined as the area surrounding major cities and industrial centers. They usually have a major urban influence. These areas are diversified and heavily developed, involving a mixed activity (agricultural, industrial, rural tourism). With the advantage of outlets, agriculture has a vegetable, fruit, or animal breeding, and intensive farming is practiced.

Intermediate rural space is defined by Bold as "agricultural space or agrarian area of the rural area", here being the cereal, fodder areas, but also vineyards and fruit holdings [6] [7]. The peripheral rural area refers to the socially disadvantaged area of the agrarian and forestry system. Agricultural lands do not have the same natural and technological potential. They are also influenced by the distance or accessibility of agricultural land to supply centers.

After Bold *et al* (2003), "the structuring of rural space in periurban, intermediate and marginal is not strictly defined. Within each category of space, there are fewer or more extensive areas (islands) of the other categories. The delimitation between spaces is, as a rule, gradual, in the confluence areas, common elements are found" [3].

The evolution of the resident population in Romania registered a downward trend, so that if in 2012 it stood at 20.09 million inhabitants, in 2018 reached the threshold of 19.5 million inhabitants, down by 2.8% compared to the reference year 2.). It should be noted that in the year 2018 the share of the rural population in the total population was 46.2%, while the city owns no less than 53.8% (Table 2).

Table 2. Evolution of the population in Romania according to the residence environment in 2012-2018

Specification	2012	2013	2014	2015	2016	2017	2018	2018/2012	% from total 2018
	Thousands of people							%	
Total	20,096	20,020	19,953	19,876	19,761	19,644	19,531	-2.8	100.0
Urban	10,854	10,791	10,753	10,703	10,636	10,531	10,503	-3.2	53.8
Rural	9,242	9,230	9,200	9,172	9,124	9,113	9,027	-2.3	46.2

Source: processed INS data, Accessed 25.04.2019.

And in the case of the population found in the urban area, there is a descending trend, thus registering a decrease of 2.3% of the population, with a population of 9.02 million (Table 2).

Table 3. Evolution of the rural population in the South-Muntenia region in 2012-2018

Specification	2012	2013	2014	2015	2016	2017	2018	2018/2012	% from total 2018
	Thousands of people							%	
The South Muntenia region	1,889	1,881	1,866	1,852	1,834	1,823	1,795	-5.0	100.0
Arges	330	328	327	325	322	320	317	-4.1	17.6
Calarasi	195	194	193	191	189	187	184	-5.7	10.2
Dambovita	368	367	366	364	362	360	356	-3.2	19.8
Giurgiu	199	201	197	196	195	196	191	-4.1	10.6
Ialomita	153	152	151	150	148	147	144	-6.0	8.0
Prahova	388	386	384	381	378	376	373	-3.9	20.8
Teleorman	256	253	249	245	240	237	231	-9.8	12.8

Source: processed INS data, Accessed 25.04.2019 [12].

Although at the level of the South-Muntenia region, the population in rural areas decreased by 5% in 2018 compared to 2012, among the most important sectors are Teleorman (9.8%), Ialomita (6%). or Călăraşi (5.7%). (Table 3.).

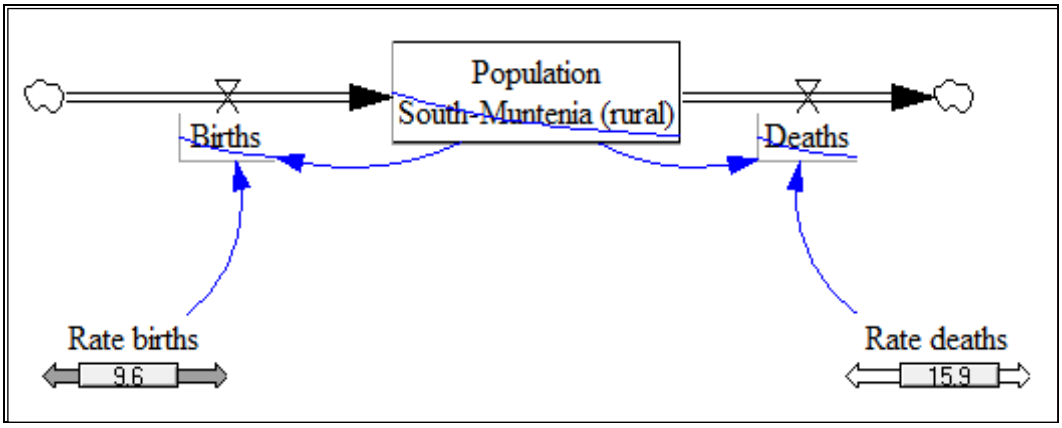


Fig.1. Scheme on factors influencing population development in the South-Muntenia region
Source: processed data INS, accessed 25.05.2019.

The birth rate and mortality rates are factors influencing the evolution of the population, so that they could estimate the evolution of the population in the South-Muntenia region. (Fig. 1.).

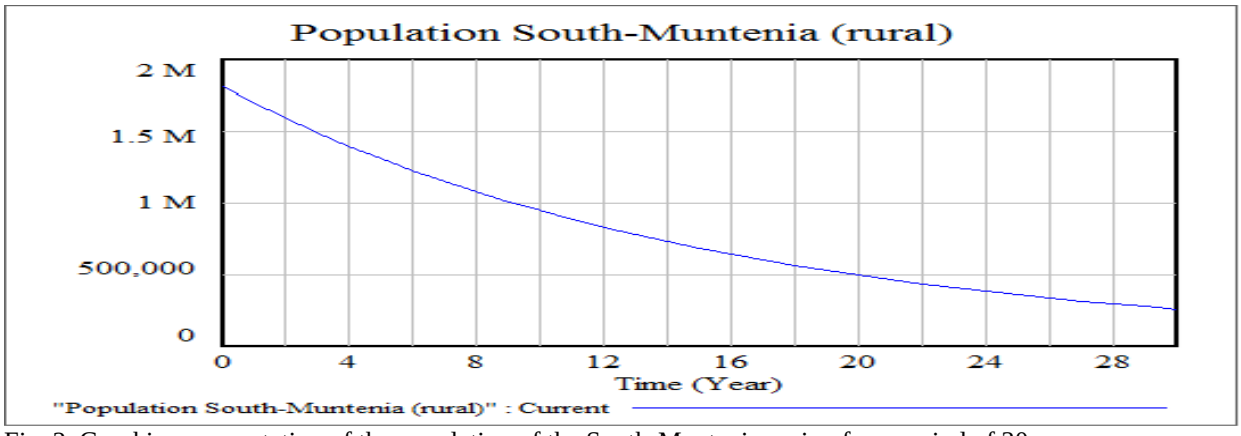


Fig. 2. Graphic representation of the population of the South-Muntenia region for a period of 30 years
Source: processed data INS, accessed 25.05.2019.

Taking into account that the birth rate was 9.6 and the mortality rate was 15.9 in 2017, according to NIS data, it was possible to estimate an evolution of the rural population in the South Muntenia region on a a period of 30 years, so that if in 2017 the number of inhabitants was 1.82 million inhabitants, while for the year 2047 a population of about 250 thousand inhabitants is predicted, if the factors that are influencing the population remain unchanged (Fig. 2.).

CONCLUSIONS

In all the analyzed papers, the great importance of the rural space for preserving the cultural heritage for future generations is presented. Also, the most complete definition is given by the European Charter, which specifies the scope of the rural area, but also the activities included in this region.

At present, the economic function plays perhaps the most important role in the survival of young people in rural areas. This is due to the lack of jobs, but also to non-agricultural activities meant to diversify the economic activity of the locality. Economic diversification has been encouraged through the sub-measures of the National Rural Development Program (6.2 Support for the establishment of non-agricultural activities in rural areas and 6.4 Investment in the creation and development of non-agricultural activities), which allowed the establishment of craft workshops, private (private) cabinets, veterinary practices, hairdressers, beauty salons, etc.

However, rural space has not benefited from sufficient development to maintain or attract young people in these regions, except for a few localities such as Semlac in Arad County. A negative example, like many other localities found in the plain area, is also the case of Grindu, where the population has declined and economic activities are insufficient to attract young people. Also, economic activity is concentrated around several agricultural holdings (associations) that work on leased land from the elderly or those who migrated to urban centers [8] [10].

The economic and social problems encountered in the localities such as Grindul in Ialomita County are extended to the plains, characterized by the villages that have been gathered, where agriculture is preponderant, but due to the technological evolution, the work of the earth can not be achieved without the specific machinery which only have high performance holdings.

Rural space is the legacy of the ancestors, but also the link between the younger generation and the elderly. The presence of all the elements that can convince young people to remain in rural areas also contributes to maintaining close relationships between the two generations, allowing their parents to stay with their children to help and advise them.

The preservation of traditions is closely linked to the existence of rural space. The modern man, trapped in the daily trap, tends to forget the traditions and customs of the place where he originates. The rural area has precisely this purpose, to remind you, at any point of your life that is coordinated with life, the principles of life as well as the traditions and customs that shape their life experience.

The inhabitants of the countryside best preserve the native intelligence of a nationality. Only in the rural area can you find the authenticity that brings you closer to the origins, so that you keep this link with what it was, but also to build the future on solid ground, keeping in direct contact with the inheritance offered by the rural space [16].

At the level of the European Union, rural space is the starting point when developing development strategies. Irrespective of nationality, the importance of rural space is highlighting and can provide not only a picture of what it was, the heritage left by ancestors, but it can also be the place where the young generation can thrive [18].

Population at the national and urban and rural levels has fallen sharply due to a number of factors such as migration (to other European Union countries looking for better living conditions) and the reduced birth rate relative to grade aging population.

The rural area of the South-Muntenia development area is characterized by a

predominantly agricultural activity, which is the main occupation of the people from the villages. Also, this extremely valuable agricultural area is exploited by the large farmers operating on the territory of Romania. Of all the counties that make up the South-Muntenia region, potential tourism is encountered at the level of Prahova and Argeş counties, where the rural population registered a decrease below the region's average. This is explained by the fact that in these counties people living in rural areas have a natural tourist potential that helps them to carry out other activities, which are not related to agriculture or related to this area, such as agro-touristic guesthouses.

REFERENCES

[1]Bădescu, I., Cucu-Oancea, O., Șișeștean, G., 2009, Treaty of rural sociology. Sociology Institute of the Romanian Academy, Mica Valahie Publishing House, Bucharest, 15-23.
[2]Berca, M., 2003, Engineering and resource management for rural development, Publishing Ceres, Bucharest, 88-96.
[3]Bold, I., Buciuman, E., Drăghici, M., 2003, Rural space- definition, organization, development, Mirton Publishing House, Timisoara, 52-74.
[4]Burcea, M., Micu, M.M., 2011, Size and characterization of agricultural holdings in Romania reported in EU – 27, Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development ", Vol.11(1):22-25.
[5]Doltu, C., 2011, The countryside between survival and business opportunities (Mediul rural intre supravietuire si oportunitati de afaceri), Expert Publishing House, Bucharest, 103-117.
[6]Dona, I., 2015, Rural Economy, Publishing Economica Publishing, Bucharest, 157-158.
[7]Dona, I., Dobre, C., Gergely, S., 2005, Rural development, Online course, Bucuresti, http://www.managusamv.ro/images/pdf/dezvoltare.pdf Accessed on.24.03.2019.
[8]Dumitru, E. A., Micu A. R., Alecu I. N., Tudor, V., Micu M. M., 2017, Analysis of the Situation of Romanian Village - Case Study Grindu Commune, Ialomita County, Conference: 29th International-Business-Information-Management-Association Conference Location: Vienna, Austria, Vol. I-VII, 740-747.
[9]Hâncu, D., C., 2010, Rural Development, Matrixrom Publishing (Dezvoltare Rurala, Editura Matrixrom), Bucureşti, 74-80.
[10]Micu, A. R., Dumitru, E. A., Tudor, V., Alecu I. N., Micu M. M., 2017, The Factors That Influence The Development Of Rural Villages Case Study Semlac Commune, Arad County, Conference: 29th International-Business-Information-Management-Association Conference Location: Vienna, Austria, Vol. I-VII, 748-756.
[11]Micu, M.M., Tudor, V., 2012, Distribution of farms and utilized agricultural area of Romania by the size classes according to legal personalities, Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development", Vol.12(1):127-132.
[12]National Institute of Statistics, http://www.insse.ro/cms/, 25.04.2019.
[13]Otiman, I. P., Mateoc-Sirb, N., *et al*., 2006, Sustainable Rural Development in Romania, Academia Romana Publishing House, Bucharest, 144-146.
[14]Recommendation nr 1296/1996 of the Parliamentary Assembly of the Council of Europe on the European Charter for Rural Areas.
[15]Regulation (EC) No 1059/2003 establishing a common classification of territorial units for statistics (NUTS).
[16]Rusu, T., Moraru, P., Cacovean, H., 2011, Rural Development, RisoPrint Publishing House, Cluj-Napoca, 64-66.
[17]Valter, C. A., 2012, The strategy of developing rural tourism and ecotourism in Romania in the context of European requirements, 1st Ed., Universitara Publishing House, Bucharest, 94-101.
[18]Ungureanu, G., Mateoc-Sirb, N., 2012, Regional and rural development, Tipo Moldova Publishing House, Iași, 34-38.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE NATIONAL RURAL DEVELOPMENT PROGRAM - A CHANCE FOR AGROTOURISM DEVELOPMENT IN THE SUCEAVA COUNTY

Roxana FRANZUTTI[1], Cătălin Răzvan VÎNTU[1], Dragoș SMEDESCU[1], Dănuț UNGUREANU[2], Valentina Constanța TUDOR[1], Gina FÎNTÎNERU[1]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăști Blvd., Bucharest, Romania, Emails: refranzutti@gmail.com, catalin_vintu@yahoo.com, smedescudragos@yahoo.com, valentina_tudor@yahoo.com, gina2007ro@yahoo.com
[2]Romanian Academy – National Institute of Economic Research "Costin C. Kirițescu", 49 Petreni Str., Vatra Dornei, Romania

Corresponding author: catalin_vintu@yahoo.com

Abstract

Since the 1950`s, the tourism industry played a very important role for the global economic development. In 2017, tourism contributed with a fare of around 10% at the worldwide level. For the European Union, tourism has a very high significance for the market. Half of the tourist international arrivals are taken over by the European region and the economic contribution is similar for the rest of the world. Beside this, tourism has a high relevance for employment, with a contribution of around 12%. Unfortunately, for Romania, a country with a very high tourism potential, its resources are not exploited as appropriate, and the tourism contribution represents half of the European average. Our country occupies the 159th position out of 185. Besides this, the agrotourism for the Romanian market does not have a very high share, as it is still a developing segment of tourism. It started to take amplitude from 2000, when Romania received accession funds through the SAPARD support program. Since 2007, agrotourism received financing through the National Rural Development Program (NRDP) in the two multi annual financial frameworks: 2007-2013 and 2014-2020. The present study aims to analyse the situation in the N-E region and Suceava County from an agrotourism perspective by taking into consideration the effect of the rural development program on the number of agrotouristic structures, number of beds and employment. By the number of agrotouristic structures, the county occupies the third place in Romania, passed by Harghita County (281) and Brasov County (200) in 2007.

Key words**:** *agrotourism, rural development, measures, N-E Region, Suceava County*

INTRODUCTION

The transition to the market economy made the tourism sensitive to the economic and social sector, stimulating the demand and the offer of Romania tourism products, [14] Romanian economy being closely linked with the possibility of meeting the needs. [15] Statistics conducted by World Tourism Organization determinates that rural tourism is growing at a higher speed than international tourism as a whole. [8] Agrotourism is the segment of tourism practiced in rural areas, based on the provision of accommodation, meals and recreation within the household. [11]

Tourism represents a huge marketplace where there is demand for a large variety of products and services. [4]

For the EU economic development tourism plays a very important role, with a contribution of 10.3% in 2017, and with an employment rate in the above-mentioned sector of 11.7%. The European region plays the most important role in terms of international tourist arrivals; in 2017 according to the World Tourism Barometer (WTB) the region received 671 million foreign tourists which represent 50.7% of the whole market - 1,323 billion tourists. The total amount of bed places in EU is 31,747 million, from this 13, 49 million, which represents 42.5%, are in rural areas.

In Romania's case, the total bed places is almost 333,000 in 2017, which represents 1% of the total European capacity, according to Eurostat (Common context indicators for rural development programs 2014-2020 – Tourism

infrastructure). The accommodation places that Romania has in the rural areas is of 104,000, which represents 0.77% of the total rural accommodation capacity that exists in European Union. In the North-Est region, which the analysed County Suceava is a part of, there are a total of 30,000 places, of which 40% are in rural areas - about 12,000. In order to obtain these values, at EU level, there are almost 11 million employees (10,973,000), which represent 4.8% of the total of almost 228 million employees in all the economic sectors. Romania has an occupied population in the tourism sector of 203,000 persons from a total of 8.671 million employees in all the economic sectors. This represents 2.3% of the total of employees and 1.85% of the total number in tourism, in EU. In the N-E region, the tourism sector has a 1.7% employment rate, more specifically 26,400 people work out of a total of 1,580,000.

During 2007 and 2013, respectively 2014 and 2020, NRDP supported the development of agrotourism through measures 3.1.3. and its predecessor, 6.4 of the current financial framework.

According to the NRDP report on Measure 3.1.3. from December 31, 2015, 3,703 projects (with a total value of approx. 570 million euro) were submitted from 2008 to 2012, of which only 2,586 projects were selected, in the end being contracted only 1,289 (with a value of approx. 180 million EUR).

At the level of sub-measure 6.4, which had a public allocation of NRDP funds of 166 million EUR, 2,512 projects were submitted, of which 985 were selected (with a value of approx. EUR 163 million). Concerning the contracted projects, the total number was 877, of which only 224 were completed on April 11, 2019, according to MADR. At the same time, there were also 297 transition projects, out of which 238 were completed. The payments to date consisted of 54.1 million EUR and of 11.8 million EUR for the transition.

MATERIALS AND METHODS

The research methodology is based on the study of the specialized bibliography, the compilation of the database, the data processing, the analysis and the interpretation of the results, as well as the formulation of the conclusions and recommendations.

The working methods used are those specific to such a study, namely: monographic method, analysis of the statistical data provided by Romanian National Institute of Statistic, Eurostat, National Rural Development Program (NRDP) and The Agency for Rural Investments Financing (ARIF), graphical method and diagnostic analysis, as well as the using of STATA SE14 program.

Our database includes records at a national, regional and county level on arrivals, overnight stays, average duration of stays, the evolution of net usage of accommodation capacity, number of employees for Suceava County and agrotourism structures, number of beds for Suceava County and Romania. At the same time, we use indicators provided by NRDP for projects on Measure 3.1.3. in 2007 and 6.4. in 2017.

RESULTS AND DISCUSSIONS

Since 1990, the interest for tourism grew. Rural tourism in Romania has an old tradition, but was never organised, always sporadic, spontaneous, and accidental. [12]

In order to better understand the evolution of the distribution of the number of beds for Agroturistic holdings in Romania, we generated two maps, one for 2007 and one for 2017. The program used to create the maps is STATA SE 14 using the command ".spmap", a module used for drawing thematic maps.

We can see a concentrated distribution in Braila (2,396 beds), Harghita (2,273 beds), Suceava (1,267 beds). There are some counties where agrotourism is not developed - Teleorman, Olt, Galati, Brasov, and Botosani.

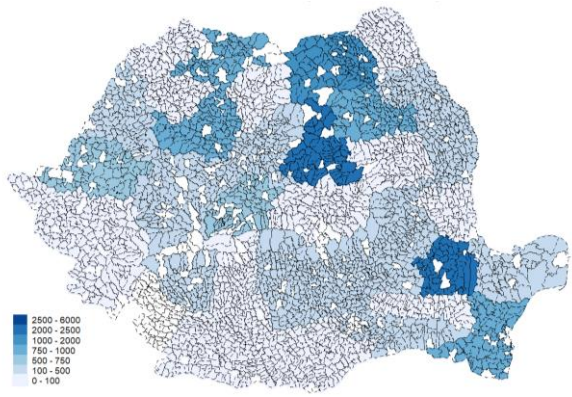


Fig. 1. The distribution of number of beds for Agrotouristic houses in 2007
Source: Projected by author after INS – Tempo online, 2019

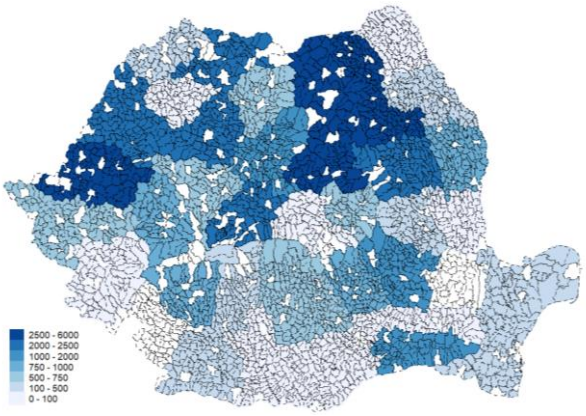


Fig. 2. The distribution of number of beds for Agrotouristic houses in 2017
Source: Projected by author after INS – Tempo online, 2019.

In 2017, we can see an upward trend in growth compared to 2007.

Overall, the number of beds for the two analysed years have increased with 21.16% from 283,701 in 2017 to 343,720 in 2017. At the same time, the number of touristic structures increased from 4,694 to 7,905 in 2017, which represents around 70%. The agrotourism in Romania was supported by the rural development measures present in the two multiannual financial frameworks for the 2007 – 2013 period, with measure 3.1.3., when a number of approx. 1,300 projects and were financed, and 2014-2020 when over 1,800 projects were supported. In 2007, Romania registered 1,292 agrotourist boarding houses, after having benefited from the SAPARD Program support during the pre-accession period, and in 2017 the number of agrotouristic pensions almost doubled, reaching 2,556 structures.

The N-E Region was created in 1998, the main reason being the coordination of European Union fund absorption of regional development projects. [1] The N-E region has one of the lowest GDP per capita. [10] Also during the 2007 – 2017 period, the North – Est region (formed from Bacau, Botosani, Iasi, Neamt, Suceava and Vaslui counties) recorded a growth of 70%, from 18,414 to 31,328 accommodation places. Regarding the situation of touristic structures, the region registered an increase, having more than doubled the number, from 459 in 2007, to 985 in 2017. If in 2007, the number of agrotouristic structures was of 196, which represented about 43% of the total number in the region, in 2017 their number is of 451 and it represented about half (46%) of the total number of existing structures. The agrotourism sector in Romania can be improved by accessing the EU funds that can assure better accommodations and agreement conditions, qualified personal in tourism, better promotions on national and international markets. [13] The local authorities, together with the citizens from the N-E regions understood the importance of the promotion of rural areas and their beauties. [7] In economic terms, the main advantages over other areas of activity are the low use of raw materials (a low rate of imports for this sector), eco-friendly energy consumption, domestic consumption, ensuring a balanced development of all areas. [2]

An alternative of economic activities diversification is represented by rural tourism and agrotourism. Tourism, more than any other field of activity, is dependent on the environment. [5] Romania has plenty of natural and entropic elements (archaeological sites, libraries, churches), [6] but the percentage of beds in tourist accommodation is lower in rural areas comparing to EU-28. Although Romania has a great potential for the developing of rural tourism, putting it into practice represents a necessity. [9] A minus is determined by the lack of infrastructure (direct road access, internet connection,

sewerage, natural gases, water supply). A clear solution for rural areas is the agrotourism development, which can ensure an economic growth by creating new jobs, attracting local and foreign investors, as well as young people into rural communities that are facing aging population. [3]

Suceava county, part of the North-Est region, recorded a rhythm of growth in the above-mentioned period of almost 74%, from 6,831 to 11,883 accommodation places.

Table 1. Accommodation structures

	Years		%
	2007	2017	2017/2007
Total	Structures		
Romania	4,694	7,905	168.41
N-E	459	985	214.60
Suceava	236	441	186.86
Agrotouristic structures	Structures		
Romania	1,292	2,556	197.83
N-E	196	451	230.10
Suceava	120	225	187.50

Source: Projected by author after INS – Tempo online, 2019.

In the N-E region, Suceava County plays an important role regarding the tourist structure because

it owns about 52% of the total of the six component counties. In 2017, the county maintains its power, recording 441 structures out of the 985 existing in the region. At agrotouristic structures, the number registered in 2007 was 120, reaching 225 accommodation units in 2017 (it owns about 52% from the total of 6 component counties).

In 2017 in the UE-28 were reported 317,470,000 accommodation places, from which 43% were in the rural areas, according to Eurostat.

Comparing the rhythm of growth of accommodation capacity in Romania, the accommodation capacity for agrotourism holdings almost tripled, from almost 15,500 to 44,500 in 2017. At the N-E regional level, the registered growth was of 265% from 2,857 to 7,562 in 2017.

Table 2. Accommodation capacity

	Years		%
	2007	2017	2017/2007
Total	Accommodation capacity		
Romania	28,3701	343,720	121.16
N-E	18,414	31,170	169.27
Suceava	6,831	11,883	173.96
Agrotouristic structures	Accommodation capacity		
Romania	15,448	44,499	288.06
N-E	2,857	7,562	264.68
Suceava	1,627	3,711	228.09

Source: Projected by author after INS – Tempo online, 2019.

At Suceava County level, the rhythm of growth regarding the accommodation capacity was a little lower, the value being around 230%, compared to the whole region, from 1,627 in 2007 to 3,711 in 2017.

In Fig. 3 is presented the rhythm of the evolution of beds capacity, having 2007 as the base year. We can see a positive growth for the analysed indicator.

Table 3. Average accommodation places/unit

	Years		%
	2007	2017	2017/2007
Total	Average accommodation places/unit		
Romania	60.44	43.48	71.94
N-E	40.12	31.64	78.88
Suceava	28.94	26.95	93.09
Agrotouristic structures	Average accommodation places/unit		
Romania	11.96	17.41	145.61
N-E	14.58	16.77	115.03
Suceava	13.56	16.49	121.65

Source: Projected by author after INS – Tempo online, 2019.

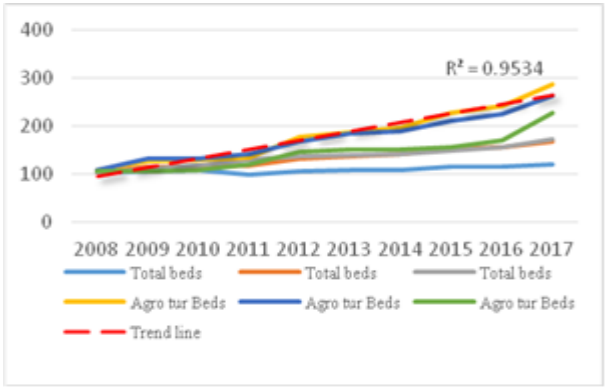


Fig.3. The rhythm of the evolution of beds capacity having as base year 2017

Source: Projected by author after INS – Tempo online, 2019

CONCLUSIONS

Agrotourism is an important source of revenue growth. It has a number of peculiarities, and agrotourism production includes both natural values, as well as cultural and social values.

National Rural Development Program played and will continue to play the most important role for rural development. For the Romanian Agrotourism, the second Pillar of Common Agricultural Policy supported the development of almost 1,300 projects, which have been implemented in the 2007 – 1013 framework, and around 1,100 projects in the current financing program of which around 500 are already implemented. At the same time, NRDP contributed to increase promotion, provided support from local authorities, developed infrastructure, maintained the Romanian cuisine and conserved the rural traditions. The N-E region registered a significant growth regarding the agrotouristic accommodation capacity, which almost tripled. This trend was maintained at the level of overnight stays, which almost tripled, reaching 330,000 overnights, which is 280% over the base period of 2007, followed by tourist arrivals, which recorded a 278% increase, reaching about 180,000 tourists in 2017. Suceava County maintained its growth rate at the level of its region, with increased tourist arrivals from just over 25,000 in 2007 to 77,000 in 2017, and booked nights following the same trend, the increase being of 290%, reaching around 165,000 overnight stays in 2017. In conclusion, the decade spent by Romania in the EU has brought significant positive changes especially at agrotourism level. For the property owners, at the Suceava County level, this decade has contributed to the increase of the receipts, the argument being that in 2007 the index of net using the agrotouristic accommodation capacity was 15.5%, rising in 2017 to 22%.

REFERENCES

[1]Beciu, S., Popa, O., Nistor, S., Olteanu, V., (2011). The socio-economic dimension of rural development for the North-East Region of Romania. African Journal of Agricultural Research, 6(28), 6042-6051.

[2]Bouaru, C. P. (2006). Strategii de dezvoltare a turismului în Bucovina. Revista de turism-studii si cercetari in turism, (2), 37-41.

[3]Burja, C., Burja, V. (2014). Sustainable development of rural areas: a challenge for Romania. Environmental Engineering & Management Journal (EEMJ), 13(8), 1861-1871.

[4]Buzoianu, O.A.C, Stefan, M., Popescu, M.L., Andreica, A., (2019), Analysis of the Romanian sites from the perspective of the relationship strategies on the tourism market. Quality-Access to Success, 20, 146-151.

[5]Călina, A., Călina, J., Stan, I. (2017). Research regarding the sustainable development of agritourism in the neighbouring area of Cozia National Park, Romania. AgroLife Scientific Journal, 6(2), 33-42.

[6]Chiran, A., Gîndu, E., Jităreanu, A. F., Vîntu, C. R., & Ciornei, L. (2016). Efficiency opportunities for the agrotouristic activities in Bucovina (case study in Vama, Suceava County). Lucrări Ştiinţifice Management Agricol, 18(1), 235.

[7]Ciornei, L. (2011). Research on the current situation of agritourism in Bucovina. Lucrări ştiinţifice, 54(2), 108-111.

[8]Ciurea, I. V., Ungureanu, G., Mihalache, R., & Ignat, g. (2011). Agritourism, one of the main factors in sustainable rural development in NE region. Lucrări ştiinţifice (54), 111-115.

[9]Condratov, I. (2006). Priorităţi ale turismului rural românesc. Revista de turism-studii si cercetari in turism, (1), 48-51.

[10]Dorobantu, M. R., Nistoreanu, P. (2012). Rural Tourism and Ecotourism–the Main Priorities In Sustainable Development Orientations of Rural Local Communities in Romania. Economy Transdisciplinarity Cognition (15), 259-266

[11]Gontariu, I., Tulvinschi, M., Curelet, M., The effects of agrotourism development on the Romanian rural environment. Turismul rural românesc în contextul dezvoltării durabile. Actualitate şi perspective, Vol.1 (2): 55.

[12]Stefan, M., (2008). Activities'Diversification within the central development region by agrotourism. Bulletin of the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Agriculture, 65(2), 163-167.

[13]Şusu, S. (2007). Rolul turismului în Regiunea de dezvoltare Nord-Est. Revista de turism-studii si cercetari in turism, (3), 63-66.

[14]Tenie, B., Fîntîneru, G., Smedescu, D., Fîntîneru, A. (2018, July). The Romanian Agrotourism Over the Last Two Decades: Good Old Places or New Attractions?. In "Agriculture for Life, Life for Agriculture" Conference Proceedings Vol. 1, No. 1, 183-189. Sciendo.

[15]Vîntu, C. R., Alecu, I. N., Chiran, A., Leonte, E., Jităreanu, A. F., Ştefan, M. (2017). Researches on the agrotouristic offer of guest houses in Dornelor bassin (case study). International Journal of Conservation Science, 8(3), 419-430.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

REGIONALIZATION INCREASING ACCESS TO WATER SUPPLY AND SANITATION IN RURAL ROMANIA

Dumitru Florin FRONE[1], Simona FRONE[2]

[1]University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile:+40744 6474 10, Email:ffrone@hotmail.com
[2]Institute of National Economy, at the Romanian Academy, 13, Calea 13 Septembrie, District 5, 050711, Bucharest, Romania, Tel/Fax: +40213182467, Email: frone.simona@gmail.com

Corresponding author: frone.simona@gmail.com

Abstract

The topic of increasing the access to water supply and sanitation infrastructure is of high importance in political and scientific endeavours dedicated to sustainable development worldwide. For a sustainable rural development and a more effective environmental protection, in Romania there are still problems and efforts of investment to be made in securing the rural population access to public utilities of water supply and sewerage sanitation. This is an issue since the water supply and sanitation networks are not covering all the areas but also due to the low rural acknowledgement and affordability of the public WSS services. However, in the last decade after the access of Romania to the European Union, to implement the Water Framework Directive (2000/60/EC) the water sector has seen important reforms and development. Perhaps the most efficient and pro-active feature was the process of regionalization of WSS utilities, so the paper analyses some of the main outcomes and developments in the recent process of regionalization and consolidation of the water and wastewater networks and services, focusing on the objectives, challenges and outlooks for increasing the connection to WSS in the rural Romania.

Key words**:** *water supply, sewerage, regional operating companies (ROC), rural, connection*

INTRODUCTION

There is an increasing concern for improved access to water supply and sanitation infrastructure in rural areas, due to the numerous benefits of this service for all the actors concerned, for the community, the sustainable rural development and, last but not least, for the natural environment.

In many important studies and in own previous research, some of these issues and objectives have been analysed from several and different viewpoints, since the development of water infrastructure and the related problems have many significant features and factors to be considered when designing and analysing the best strategy of sustainable water supply and sanitation development.

For instance, as analysed in the economic and efficiency issues of a Sustainable Water Management [2], for sustainable and effective water management in all the areas and sectors, it is required a mix of theoretical and practical approaches dealing with the water demand challenges. The welfare theory combined with the sustainable development paradigm has meant increasing awareness on the features of water as a quasi-public good, no longer free since a valuable economic good.

On the other hand, the investment and collateral costs involved for implementing in Romania the Water Framework Directive (60/2000/EC) are quite high but there are direct and indirect benefits of economic growth. Some of the deeper research has revealed, using regression and correlation analysis and other statistical methods that in Romania, at the county level, there is a positive correlation between the rate of access to the public water supply and sanitation and economic development. [6]

Besides, another relevant issue for sustainable rural development is the importance of water infrastructure investments for higher water security in the food and agriculture sector. This has been analysed and emphasized based

on the research outcomes and conclusions of agri-food and sustainable water management experts as well as on computations showing the recent water demand and use trends of the Romanian agriculture. [8]

As a result of these theoretical and practical insights and requirements, in the last decades since 2000, there are many and complex institutional, economic and technological reforms in the Romanian water/wastewater sector. The main objectives of these reforms are: increasing the financial sustainability of the WSS sector, according to the mechanisms of the market economy; providing environmental protection through the national and local development of water and wastewater utilities.

The process of regionalization of WSS utilities may be one of the most important and pro-active reform, so in the paper there is a brief review of key achievements obtained through the recent policy of regionalization and development of the water supply and sanitation companies in Romania. However, the focus is on the determinant role of the larger Regional Operating Companies (ROCs) in the sustainable rural development and access to WSS networks and service.

MATERIALS AND METHODS

The purpose of this research is to identify the evolution of the rural connection to the water supply and sanitation (WSS) in Romania, specifically in the rural localities, since the regionalization reform of the operating companies has occurred.

Theoretical and quantitative research was used to describe the situation of the rural population related to the studied matter, using quantification and statistical methods of analysis, including:

• Relevant literature and previous research outcomes review;

• Definition and theoretical analysis of the operational concepts, such as the economies of scale characteristic to regionalization of utilities;

• The analysis and synthesis of main strategic objectives for sustainable development in the Romanian WSS sector;

• Some chart and graphs figures on the nature and direction of evolution are extracted from relevant national or international reports while others are based on own data computations, in view of a comparative analysis for the trends of selected indicators.

The period analysed in this study was 2007-2017, but there are also references to some older data, as extracted from the World Development Reports of progress towards the MDG. The data, collected mainly from international databases, the National Institute of Statistics (NIS) and from the reports of the Romanian Water Association, have been processed and interpreted, highlighting the main challenges and reasons for the still poor or slow developments and also showing the latest outlooks.

RESULTS AND DISCUSSIONS

Background

Nowadays, the insufficient access to water supply and sanitation is quite a critical issue at global scale, making thus the objective of some important Millennium Development Goals. The Millennium Development Goals (MDG) have called for halving the proportion of the population without access to improved water sources and sanitation by 2015. [12]

Despite some international aid and the local development aspirations, the access to drinking water supply and to wastewater sanitation is still challenging in several countries of the European region, among which in Romania.

In most countries, the access to water supply and sanitation utilities is also inequitable. The insufficient or poor access does not affect randomly human populated settlements but rather the poor and mainly the needy rural people. Villages have consistently lower levels of access than urban areas to water and sanitation services. [3]

As mentioned in an important worldwide report [12], at the global scale:

"|although 2.6 billion people have gained access to an improved drinking water source since 1990, there are still some disparities of concern for a sustainable and equitable

development of water supply and sanitation: 96 per cent of the global urban population uses improved drinking water sources, compared with 84 per cent of the rural population; Eight out of ten people still without improved drinking water sources, live in rural areas; 82 per cent of the global urban population, and 51 per cent of the rural population, uses improved sanitation facilities; Seven out of ten people without improved sanitation facilities, live in rural areas."

Therefore, the issue of sustainable water management and universal access to WSS is being now tackled by the Sustainable Development Goals (SDG). It is therefore stated that proper water and sanitation is a key foundation for achieving the Sustainable Development Goals, including good health and gender equality. [13]

By managing water sustainably, people should become able to:

-better manage the production of food and energy;

-contribute to decent work and economic growth;

-preserve the water ecosystems, their biodiversity, and take action on climate change.

There was also previously underlined the importance of the water security concept for the sustainable rural and agri-food development [8], since representing the sustainable availability of water quantity and quality acceptable for production, livelihoods and health, coupled with an acceptable level of risk to society related to unpredictable water related impacts.

Another important research outcome of the cited study was that, in Romania, the total amount of water abstracted in agriculture (including forestry and fishing), is quite significant and aggregates nearly 20% of the total water abstraction. This total volume of agricultural water demand is of about 1000 million cubic meters/year, almost equal to the volume of water abstracted in Romania for the activity of public collection, treatment and supply of water. [8]

Last but not least, in the conclusion of [3] the rural-urban disparity of access to WSS was characterized as:

"very striking in Romania and one of the main features of the Romanian water and wastewater infrastructure, a major shortcoming for sustainable economic development, given that rural wastewater is simply discharged into the environment, polluting the soil and water".

Therefore, the Romanian public authorities recognize that the worst quality of groundwater is in the rural areas, since here the sewerage sanitation infrastructure is low developed or missing. Consequently, the wastewater directly flows into underground and pollutes the groundwater. [9]

The role and importance of the regionalization of the WSS utilities in Romania

This poor and uneven development of the water supply and sanitation networks and utilities in Romania was characteristic at the moment of the accession of Romania to the European Union, about a decade ago, in 2007.

At that time, only about 65% of the population benefited from a public supply of drinking water and bathroom indoor. This was the national average rate of access to public water supply utilities, since it involved an average of the 98% urban population ratio and 33% rate of the rural population connection. These figures are relevant since they show the severe urban-rural disparity of access which is not characteristic in the European Union (ratios of 96 - 100% of the population connected to public water supply network in urban areas and 87% in rural areas).

This lagging development state was due mainly to two main factors:

(i)the long-term under-investments in the water supply and sewage systems;

(ii)the quite poor economic, financial, environmental and strategical management of the water supply and sanitation utilities.

Consequently, the water pollution was among Romania's most significant environmental problems.

The low quality of waters was mainly due to:

- insufficient controls over industrial effluents and discharges;
- poor wastewater infrastructure (sewerage and wastewater treatment plants WWTP).

Besides the environmental issues, the pollution of waters has too long affected several activities or resources such as the drinking water sources, fish breeding, irrigation, human health etc.

In figure 1, according to the data from the World Bank it is obvious that in 2007, Romania was lagging way behind most other EU countries, especially as concerning the rural access to sanitation utilities.

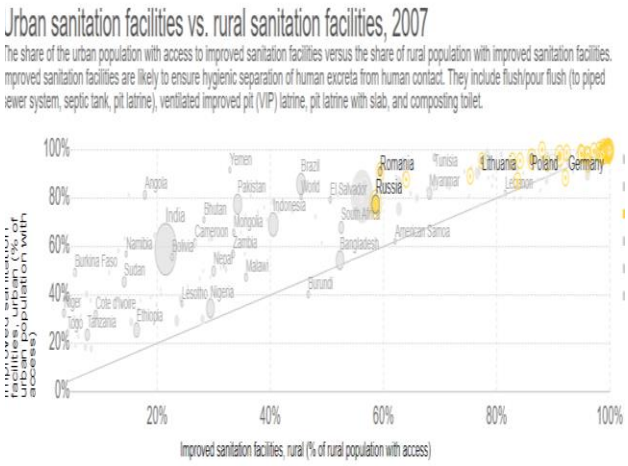


Fig.1. Urban-Rural gap in access to sanitation facilities, in Europe (Romania), 2007
Source: World Bank-WDI.

That development gap of water supply and sewerage utilities hinders Romania from complying with the EU standards of water quality and threatens human and environmental safety, mostly in unserved rural areas. For the economic pillar of a sustainable development, it should be acknowledged that this poor development of the WSS services has prevented the settlement and development of new businesses in the rural localities for a plenary use and recovery of local natural and human resources.

The management water utilities was also inadequate since the water systems had a high degree of fragmentation in small and medium municipalities with too little financial and institutional capacity. Therefore, a conclusion of a study published in 2008 was that "important strategic developments were needed to increase the efficiency and viability of public services providers and to ensure adequate level of water services delivered to the entire population within affordable limits". [4]

As member state of the EU, Romania must by 2015 comply with the EU Directive 98/83/EC on drinking water quality and by the end of 2018, with the Directive 91/271/EC on urban waste water treatment.

Romania benefits from EU financing, from the Cohesion Funds, aiming to increase the rate and pace of investments required for EU water quality compliance. In 2007-2014, the EU funding was granted within the Sectoral Operational Programme Environment. The main objective of SOP Environment was to narrow the large quantitative and qualitative gap of environment infrastructure that exists between the European Union and Romania.

Priority Axis 1 of SOP Environment was "Extension and modernization of water and wastewater systems". The most important objectives of Priority Axis 1 were:

•providing services of water supply and sanitation, at affordable tariffs and with good drinking water quality, in all urban agglomerations;

•improving quality of watercourses and sludge management for WWTP;

•creating more efficient structures of water management. [9]

An outstanding strategic approach to accomplish these objectives for the sustainable development of the Romanian water supply and sanitation was the process of regionalization.

Within a project area, the regionalization implemented an institutional framework related to the regional development, integrating the water supply and wastewater infrastructure in a common operating process of utilities. The process concentrates operation of the WSS services provided to a group of municipalities from a geographical area in a river basin and/or within administrative boundaries (municipalities, county).

As analysed in previous research, the regionalization is a reform meaning to significantly raise the quality and efficiency of

local WSS infrastructure and services. The objective of regionalization are multiple and synergy for water sector and local sustainable development:

(i)to fulfil environmental targets;

(ii)to assure sustainability of investments and operations on the long term;

(iii)to contribute to regional balanced growth.

The regionalization of the water services in Romania was also implemented to prevent the increasing sector fragmentation and to foster economies of scale. [4]

Actually, the regionalization of water services aims to provide that 2,600 localities of more than 2,000 inhabitants meet 2018-performance targets established by the SOP Environment, by concentrating the management of water and wastewater services in around 50 stronger operators, set up and developed by merging the existing local utilities into so called Regional Operating Companies (ROC).

For the Romanian drinking water and wastewater operators, this regionalization meant aggregation of two or more local operators into one regionally working operator. The respective local councils no longer have each an operator working solely for their community, but participate in a regional operating company (ROC) that will serve a number of towns and communities aggregated in an Intercommunal Development Association (IDA).

To this end, individual local authorities form as common shareholders the Regional Operating Companies (ROC) and set up the so-called Inter-Community Development Associations (IDA) to whom they delegate the exercise of their shareholder rights. The collaborative structure will allow the beneficiary local authorities to control the Regional Operating Company and to better monitor and supervise the implementation of the water infrastructure rehabilitation and modernization works. [4]

There are many factors driving the consideration of aggregation (regionalization) which increased the water utility' size in the Regional Operating Companies: increased economic efficiency; better and integrated water management; richer professional capacity in larger scale; better financing; cost sharing between higher- and lower-cost service communities.

Most of these issues are more or less relevant for the increase of rural access to the public WSS services, provided by the regional operating companies (ROCs), as discussed further. For instance, the basic economic analysis of the water/wastewater sector indicates that WSS utilities involve large infrastructure costs which can be shared by adding more customers so that each one pays a smaller share of these costs. This way, the specific scale economies of water infrastructure may be reached. [7]

However, as approached and stated in some previous papers, there is still in Romania, a significant socio-economic development gap of the rural areas, in comparison with the urban areas, and this still affects the efficient development and services of the water supply and sanitation ROCs.

The issue of access to the public WSS networks and utilities is one of the most important aspects of disparity between the urban and rural communities in Romania.

For instance, as concerning the access to public water supply, the evolution in the last about 10 years, since the EU accession was constant, at the national level, was not very balanced. The number of inhabitants served by centralized water supply system in Romania, according to the National Institute of Statistics [11], was of:

-11,790,494 people in 2009, accounting for 55.2 percent of the Romanian population;

-13,229,699 people in 2017, representing 67.5% of the Romanian population.

However, in 2017 the urban areas have registered 10,191,130 people connected to the public water supply, accounting for 96.9% of the resident population, with 150,738 people more than in the year 2016.

In the rural area there were registered 3,038,569 people served with water supply services, constituting 33.5% of the resident population of the country, with 225,851 more people than in the previous year.

Let us note that only the urban population is almost entirely provided with a service of water supply in centralized system (96.9%).

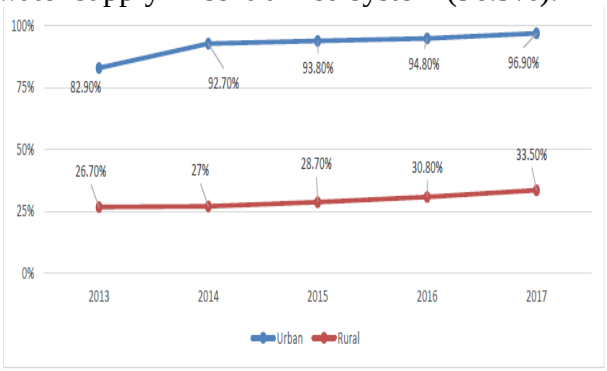


Fig.2. Evolution of the Romanian population served with public water supply services, on average, in 2013-2017, by area of residence
Source: N.I.S., Accessed in October 2018.

As regards the rural population served with water supply services from a centralized system, the share of the population that benefit from these services, grew from 26.7% in the year 2013, to 27% in the year 2014, to 30.8% in 2016 and reaching 33.5% in 2017. So the rate of the rural population connected to public water supply in rural areas is about 60% lower than the urban rate, this being a *very significant gap of sustainable rural development*.

A main reason for the large differences in the coverage of water supply between urban-rural is the poor institutional and managerial capacity of local authorities in the rural areas, who do not receive centralised water supply system, to develop, submit for funding or implement development projects for water supply services. [1]

On the other hand, this water infrastructure and services development gap is not to be neglected any longer in Romania, for a number of reasons and arguments to be analysed and acknowledged better. The need to extend and increase the accessibility of water supply services of centralized system, in rural areas, is dictated not only by the need to increase the standard of living in rural areas, as an important European trend of decreasing the gradual differences in development between rural and urban, but also by the deterioration of groundwater quality.

Last but not least, there are considered the targets for Romania's compliance to the provisions of the Community acquis, assumed by the Treaty of accession to the EU, aimed at securing the services of water supply and sanitation for all citizens.

Therefore, especially after 2000, the water supply system in Romania has benefited from a number of foreign-funded programs, (PHARE, ISPA, SAMTID, and MUDP) and post-accession programmes (SOP Environment 2007-2013 and 2014-2020 POIM). WSS operators ' participation in pre-accession programmes has led to the development of their institutional capacity and expanded or replaced their overdue water supply networks. That has supported the development of the water sector, beginning with the urban environment.

Law No. 204/2012 secured the necessary framework for a regionalisation of water supply services in Romania and creating the possibility of using cohesion funds during 2007-2013 and 2014-2020. Subsequently, the regionalization of the area of operation of the services of water supply and sewage-treatment plants contributed to the expansion of networks in rural areas, in the case of regional operators. From an institutional point of view, the regionalization process has already been completed, in 2010 and has led to the establishment of 43 regional operators.

Table 1. Evolution of the number of communities served by regional and municipal water operators, in the period 2010-2015

	Year				
Number of communities served	**2010**	**2012**	**2013**	**2014**	**2015**
Cities and towns	246	251	254	275	277
Rural communities	761	982	1162	1238	1292
Total	1007	1233	1416	1513	1569

Source: Own calculation with data from [1]

After 2010, the process of regionalization has meant the takeover by regional operators of new localities within their service area for water and sanitation utilities. [1]

As may be observed from table 1, in 2011, regional operators and municipal operators expanded their area of operation at 1,152 localities, out of which 251 are municipalities and cities and rural areas, 901.

The process of regionalization continued, so that in the year 2015, the total number of localities in the area of large operators was of 1569 municipalities, of which 277 cities and towns and rural localities (communities) a number of 1292.

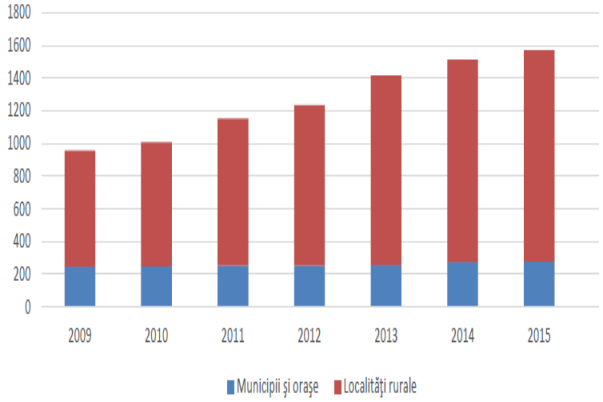


Fig.3. The evolution of the regional water operators, in terms of number of localities served during 2009-2015
Source: ARA Report, 2018

In table 1 and figure 3 it may be easily noticed that the main evolution of growth regarding the communities served with water supply and sanitation by regional operators is related to the rural communities (represented by the red column areas in figure 3).
For instance, while the total number of communities served in Romania with water supply and sanitation by regional and municipal operators increased by 55.8% in 2010-2015, that increase was even more dramatic for the rural communities (70%) as compared to the cities and towns (12.6%).
Besides, the evolution is more important and challenging in the case of sewerage and sanitation networks and services provided by the ROC (Regional operating companies).
As shown by the "Romanian Waters" National Administration documents water pollution caused by human congestion is mainly due to: the low rate of population connected to wastewater treatment and collection systems; improper operation of the wastewater treatment stations. [1]
Unfortunately, these factors strongly act in Romania, especially the first one, since there is still a shortage of both development of sewer networks, of the capacity of the wastewater treatment plants WWTP but also a low rate of connection to these systems (see table 2 and figure 4).

Table 2. Residents with dwellings connected to sewer systems, at national level in Romania

	U.M.	2008	2010	2012	2015	2017
Residents with dwellings connected to sewer systems	Million persons	9.23	9.31	9.41	9.47	9.97
Rate of residents with dwellings connected to sewer systems	%	43	43.4	44.2	47.7	50.8

Source: Own computation on N.I.S. data [10, 11]

This is bearing in mind that, in total, in the year 2017, a number of 9 978 886 inhabitants had their homes connected to sewage systems, equivalent to only 50.8% of the resident population. [5]

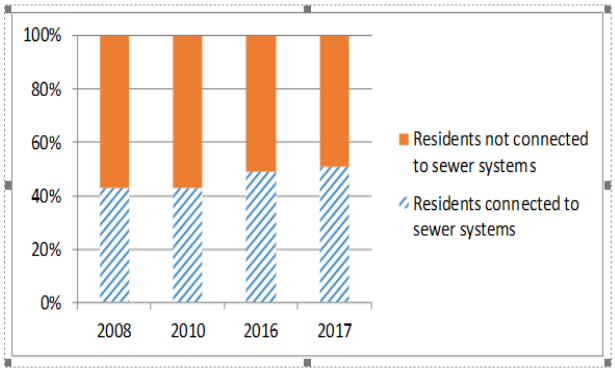


Fig.4. The evolution of the rate of residents with dwellings connected to sewer systems, at the national level in Romania (%)
Source: [5]

On the other hand, the weakest point was regarding the lack of endowment and access of rural areas to sewerage wastewater sanitation. In 2012, access to sewage was available in only about 13% of the national rural settlements, indicating a more extended state of rural underdevelopment.
This issue had to be addressed urgently by:
-large investments in extending WSS networks;
-improved access for all categories of people to the public WSS utilities. [3]
However, some progress was done since 2013, especially in extending the network of sewage nationally, with the essential

contribution of the ROC. For instance, the length of sewerage network had increased by about 37% nationally, in 2010-2015.

It should not be forgotten that investment in infrastructure also has direct impact on the local or regional economic growth. The construction and operation of infrastructure to provide quality services related to water supply and sanitation requires a great deal of investment and operation, which contributes to the creation of jobs and economic growth, in the water sector and in the served areas. Indeed, based on regression analysis, there is evidence on the positive correlation between the increased access to WSS infrastructure and the regional economic growth, proving the importance and opportunity of implementing the investments in water infrastructure in Romania, with European Structural and Cohesion funding. The regression equation showed that in Romania there is a positive correlation between access to the public water supply/sanitation and economic development at the regional (county) level. [6]

The rate of sewerage access progress seems to accelerate lately. According to latest NIS data regarding sewage systems, in the year 2017 the activity of wastewater collection from households and the economic and social units was held in 314 municipalities and cities and in 937 rural communities.

The total length of sewerage network at the end of last year was 36,344.5 km, of which 24,606.2 km (67.7%) in the municipalities and cities and only 32.2% in the rural communities. [10, 11]

Eventually, compared to the previous year, in the year 2017 the length of sewerage network expanded with 1,991.1 km (472.7 km respectively in urban areas and with 1518.4 km in rural areas), so the expansion was done mostly (76,2%) in the rural areas.

At the regional operators, there are large differences between the average number of inhabitants served by 1 km network of sewage, between urban and rural areas. Thus, in 2016, one kilometre from the sewerage system has served averaging, 403 inhabitants in the urban area or 80 rural inhabitants.

This situation is explained by the fact that the regional operators have increased the rate of access to services in rural areas, where population density but also the actual degree of connection is much lower, yet.

According to recent Eurostat data, out of the 3.98 million rural dwellings, nearly 2.9 million have access to a network of sewerage, but only 2.2 million are connected. So almost 1.8 million homes (sheltering 29.7% of the Romanian population) continue to use the pit latrines in their yard, severely polluting in time the groundwater.

The main issue is the fact that connection to sewerage of housing in rural areas must be done at the expense of each applicant, and the costs (about 500 Euro, at least) are not easily affordable, for many rural households.

CONCLUSIONS

A first conclusion is that regionalization of water and wastewater services is a structural reform which may bring many benefits from the economic but also from the environmental and social point of view, so it may be considered a factor of sustainable development.

The severe underdevelopment of the water supply and sewerage infrastructure in Romania, especially in rural areas, combined with the need to comply as soon as possible with the environmental acquis of the European Union by implementing and managing very costly investments were the driving factors of the regionalization process, which may also face some specific constraints or risks.

Nevertheless, to highlight mainly the economic efficiency issues and risks, we resume some outcomes and conclusions.

Among the main threats faced in a strong, efficient and sustainable development of the WSS sector in Romania, especially in the poor and lagging behind rural areas, is the quite low propensity to pay for water supply and sanitation by the population. This is reflected by the relatively high elasticity of water demand in relation to the price of water,

considering that water is a vital resource for life and production.

This problem of insufficient local acknowledgement and affordability is not to be neglected any more, since it has hindered a faster and more complete connection to WSS in the rural areas where the ROC have provided access to their networks.

But now, due to a new document of the Ministry of Regional Development and Public Administration (January 2019) all the municipalities are required to identify all households which are not connected to the sewage network and the Environmental Guard have to impose their connection for enforcement of the Law of Water Supply and Sanitation Service No. 241/2006, respectively of the Directive 91/271/EEC.

Another aspect of sustainable development impact of investments in the infrastructure of water supply and sanitation, is bound to the opportunity of creating jobs and promoting economic growth, through these investments for water-related services.

The main conclusion of the paper is that, the regionalization of the water supply and sanitation utilities and creation of larger Regional Operating Companies was quite a success and a necessary step in developing and extending the access to WSS services in the rural areas, poorly covered in Romania. The outlooks are quite good, due to the European funding, but there are still many more objectives, challenges and outlooks of increasing the access and connection to WSS in rural Romania to be addressed and fulfilled, especially regarding the affordability of the rural population and the administrative capacity of the local authorities.

REFERENCES

[1]ARA Asociatia Romana a Apei, 2018. Raport privind starea serviciilor de alimentare cu apă şi de canalizare-epurare în anul 2017 (Romanian Association of Water, Report on the state of water supply and sewage treatment in 2017).

[2]Frone, D. F., Frone, S., Stoian, M. 2012, Oobjectives and challenges of water demand management. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 12(3): 47-50.

[3]Frone, S., Frone, D. F. 2013, Promoting access to water suppy and sanitation: Issues and challenges in Romania. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 13(2): 165-170.

[4]Frone, S., 2008, Factors and challenges of regionalization in the water and wastewater sector, in Romanian Journal of Economics nr.2 (27)/2008.

[5]Frone, S., Constantinescu, A., 2018, Concerns and Challenges on Wastewater Treatment Capacities Development in Romania, in Annals of the „Constantin Brâncuşi" University of Târgu Jiu, Economy Series, Special Issue Ecotrend, 2018.

[6]Frone, S., Frone D.F., 2014, Challenges in analyzing correlation between water infrastructure and economic development, Procedia Economics and Finance 10 (2014).

[7]Frone, S., Frone, D.F., 2012, Factors and Trends of Economic Efficiency in the Water/Wastewater Sector, in Procedia Economics and Finance, Volume 3, Elsevier, 2012.

[8]Frone, D.F., Frone, S., 2015, The Importance of Water Security for Sustainable Development in the Romanian Agri-Food Sector, Agriculture and Agricultural Science Procedia Volume 6, 2015, pp. 674–681

[9]Ministry of Environment, 2012, ROWATER National Administration, The Situation in Romania of Urban Wastewater and Sludge from Treatment Plants-Brochure for public 2012.

[10]National Institute of Statistics, Data-base TEMPO on-line http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table, Accessed on March 10, 2019.

[11]National Institute of Statistics, Press-release No.249/28, Septembrie 2018.

[12]UNICEF and World Health Organization, 2015. Progress on Sanitation and Drinking Water – 2015 update and MDG assessment, 2017.

[13]United Nations, SD Goal 6 Clean Water and Sanitation: Why it matters, http://www.un.org/sustainabledevelopment; wateractiondecade.org, Accessed on March 10, 2019.

[14]World Bank, World Development Indicators /Themes /Environment http://datatopics.worldbank.org/world-development-indicators/themes/environment.html, Accessed on March 10, 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

POLISH AGRICULTURE. A CASE STUDY: EXTENSION SERVICES – RETROSPECTIVE PERSPECTIVE AND CURRENT ISSUES

Benon GAZINSKI

Institute of Political Sciences, Warmia and Mazury University in Olsztyn, 11 Szrajbera Street, 10-007 Olsztyn, Poland. Phone (mobile): +48-506-138-524, Fax: +48-89-527-08-01 Email:begaz@uwm.edu.pl

Corresponding author: begaz@uwm.edu.pl

Abstract

An attempt of this article is to review experiences of the Polish agricultural extension services in a broad historical context. In the introductory part, turbulent history of the one century (1918-2018) is outlined. Then, experiences of agricultural extension are briefed, coming back to the 19-th century, a period of the partition and including achievements of agricultural extension in a brief interwar period. In the following section of the article, dilemmas of agricultural extension services during a Centrally Planned Economy regime are presented. It is pointed-out that they were a victim of dominating ideological concerns over the economy with resultant half-hearted approach towards dominating peasant sector. Then, experiences of the Polish system transformation and European integration processes are overviewed. In particular, a new initiative (emerged in 2015) – "Network for Innovation in Agriculture and Rural Areas" is briefed. In the concluding part, Polish experiences, both successes and shortcomings, are summarized.

Key words**:** *agricultural extension, contemporary Poland's history*

INTRODUCTION

During a century (1918-2018) Poland witnesses a stormy history. Together with the end of the 1-st World War terminated 123-year long period of partitions (the Polish territory was ruled by Tsar Russia, the Austro-Hungarian empire and Prussia). Rebirth of the state meant the necessity to shape and protect borders (the Greater Poland and Silesian uprisings, Bolshevik-Polish war) and the introduction of uniform administrative and legal structures throughout the territory. There were three separate currencies, systems of education, customs or taxes. Therefore, the currency (introduction of the Polish mark, replaced by złoty since 1924), solutions in education or in the financial system were gradually unified. During a short interwar period, the first attempts to organize nationwide agricultural extension were undertaken.

The outbreak of the 2-nd World War ended this almost 20-year period of peaceful development and, once again, led to fundamental changes in both state and social structures. The state borders were almost totally changed (before the war there was above 300-kilometer section of the common border with Romania). The territory of the country decreased by approx. 48% – from 380 to 312.7 thousand square km. with over 1/3 of the present Polish area being post-German lands. Consequently, ethnic and religious relations were substantially impacted. Before the war, about one third of the total population were national minorities with different religious denominations – in today Poland, their share fell tenfold. Nowadays Poland is one of the most uniform European countries and approx. 90% of the population declares belonging to Catholic traditions.

Particularly significant consequences for the development of Poland had the enforcement of a system of Centrally Planned Economy lasting until September 1989, until the democratic breakthrough of the Tadeusz Mazowiecki cabinet.

During the socialist regime, Poland enjoyed the largest relative "margin of freedom" within so-called the socialist camp. It is due to a number of interrelated issues: relatively strong position of the Catholic church;

population resistance to solutions coming from the "East" (still vivid memory of the war with the Bolsheviks and deportations to Siberia during the Soviet occupation of 1939-1941) and peculiarities of the Gomułka and Gierek regimes – the first and one of the last Communist rulers of the country. Gomułka tried to use a small margin of freedom, being – among others – against the rapid and forced collectivization of agriculture, while Gierek was looking for "socialism with a human face" and his policy of "opening to the West" made him popular in the society.

A significant distinction of Poland from all other countries controlled by the Kremlin was not only the survival but also the dominance of the peasant sector in agriculture. However, after the unsuccessful attempts of forced collectivization, the state's agricultural policy (after 1956) was characterized by a certain schizophrenia. In milder forms, policy of collectivization was continued (difficulties in access to means of production and agricultural machinery, tax burden, lack of agricultural pensions or access to medical services on general principles) with parallel pragmatic support for peasant farming through, among others, agricultural advisory system. Hence, in 1989, the year of the fall of socialism, Polish peasants owned more than 80% of the total agricultural land. Half-hearted attempts of reforms in the 1970s (for example, Poland was at that time the only one socialist country where a citizen could have a bank account in convertible currencies) failed and did not save socialism in Poland from its fall [9].

Dramatic market failures led, in the second half of the 1970s, into the introduction of the food rationing system, gradually extended to the entire range of different products. The fact that a democratic breakthrough took place in 1989 could be attributed to several factors. Since 1985, the Brezhnev doctrine of keeping the satellite states in line, began to give room to the policy of "glasnost" and "perestroika" introduced by Mikhail Gorbachev. The peaceful "Solidarity" revolution, initiated in August 1980, despite being crushed by the authorities through the introduction of martial law (13-th December 1981), contributed to the development of the democratic opposition. The two stages of economic reforms declared by the authorities failed but, from the mid-1980s, cracks began to appear in the old structures of the socialist system – since 1985 some solutions appropriate rather to the liberal market economy were introduced. The Constitutional Court began its judicial activity in 1986. In 1987, the Rural Foundation Supporting the Supply of Water, independent from the Communist government and initiated by the Church, was established. At the same time, the Office of the Ombudsman for citizens' rights was also established. The Act on Freedom of Economic Activity, adopted in December 1988, was the real breakthrough in economic life [7].

However, the Polish economy of the late 1980s was declining (described even as the "bankrupt estate"). Under the pressure of further strikes, caused by the deteriorating socio-economic situation, famous Round Table negotiation took place. They brought an agreement between a part of the opposition and the government – its most important point was the holding of partly free and democratic elections to the Seym and the Senate (the newly appointed upper chamber of the Parliament). These elections, carried out on 4-th June 1989, resulted in the loosing of the power of the Communists and, in September 1989, non-communist government of T. Mazowiecki was constituted, the first one in the Central and Eastern Europe in the post-war period.

At the turn of the 1980s and 1990s, a radical reform package was launched, bringing the end of more than forty years of socialism in Poland. System transformation meant a simultaneous rebuilding of the political system, structures of the state and the introduction of a market economy: privatization, exchangeable currency and the resultant regulation of the economy by the market. The structure of a land ownership in Poland in 1989 was a kind of inverted pyramid as compared to other COMECON countries: state farms occupied only 20% of agricultural land, agricultural cooperatives below 5% and the remaining over 80% were

in the hands of private farmers. One of the difficulties in the transformation of agriculture was the significant diversification of the agrarian structure between the regions. While in the area of Ostrołęka (nowadays a part of the capital Mazowieckie voivodship) over 90% of the land was owned by farmers, in the North and West regions (lands incorporated into Poland after 2-nd World War), socialist sector in agriculture often exceeded 50% – in those areas rapid collapse of state farms took place with resultant unemployment and many painful social problems. Already in the first years of system transformation, the aspirations of the membership in the then European Communities were clearly confirmed by the preamble of the Association Treaty, signed 16-th December 1991. The Office of the Government Plenipotentiary for European Integration and Foreign Assistance was created in 1991, transformed in 1996 into the ministerial Office of the Committee for European Integration.

The beginnings of transformation were difficult for agriculture. Despite the provisions of the "asymmetry of benefits" in the Association Treaty (easier access to European markets), the completely opposite phenomenon took place – the balance of agricultural trade became negative for Poland. This was due to radical reforms, including liberalization of foreign trade. At that time, Polish farmers lived in more market economy environment than the European ones, enjoying the CAP "umbrella". In the period preceding the accession, there was a significant modernization of the food industry and changes in the farms themselves. As a result – contrary to many earlier fears – the integration of the Polish agri-food sector (1-st May 2005 – EU membership) was smooth and without major perturbations [8].

MATERIALS AND METHODS

The purpose of this article is to deliver the overview experiences of the Polish agricultural extension services in a broad historical perspective, covering the period of the two centuries. A research question is put if we can still learn from the past, following a Latin proverb: "historia magistra vitae est". Consequently, four different political periods are considered: the partitions, brief inter-war period, decades of the socialist regime and last era of the system transformation and the European integration. Therefore, basically it is not an empirical work but the review article, instead off. The monography approach and descriptive method is applied in this article, based on extensive literature studies. Personal experiences of the author as an academic teacher and an expert involved in rural development projects and a number of interviews with professionals engaged in rural development contributed to the concluding opinions and remarks.

RESULTS AND DISCUSSIONS

Agricultural extension in Poland. Retrospective outlook

Development of contemporary agriculture is due to a dynamic progress of science and methods of production during 19-th century. an age of "steam and electricity". This also applies to Polish lands, for a whole century divided between three neighboring countries. Until 1918 (regaining independence), the development of agricultural sciences, rural associations and the beginnings of advisory consultancy took place in various conditions and therefore exhibited a lot of dissimilarities. One of the important factors in the social development of the village was the enfranchisement of peasants. It was initiated in 1807 in the Prussian partition (the process was completed in 1850). In the Austrian partition, the enfranchisement took place as a one-step act, by virtue of the edict of 1848. At the latest, in 1864, liquidation of feudal relations occurred in the Russian partition (as a political consequence of the January Uprising) [20]. Newly liberated peasants, often of low education level and managing small and indebted farms and were not prepared for independent management – bringing them into the independent "on their own" farmers required time and support.

The first step to progress in agriculture is research related to education. The beginnings of the University level agricultural education in the Polish lands date back to the early nineteenth century. Already in 1803, the Department of Agriculture was founded in Vilnius at the local University – one of the pioneers of Polish agricultural sciences, Michał Oczapowski was a Member of its Staff during a period 1819-1831. At the Jagiellonian University of Cracow (established in 1364, the oldest in Poland), the Department of Agriculture was established in 1806. However, it was abolished three years later by the Austrian authorities. At the University of Lvov, the Department of Agriculture was erected in 1814. In those years alone, in 1816 the Institute of Agriculture in Marymont was founded (it initiated today's the SGGW, the Warsaw University for Agriculture) [3].

The advancement of agricultural sciences was accompanied by the expansion of scientific literature. It is estimated that 98 agricultural journals were issued during a period 1795-1860. Some of them are worth to be mentioned as they are available to the readers until today. In Warsaw, since 1820 "Sylwan" is issued, recognized as one of the world oldest journals on forestry. In 1903, the first volume of "Roczniki Nauk Rolniczych" [Yearbooks of Agricultural Sciences] appeared in Cracow. Dissemination of progress in agriculture was not yet institutionally organized. In the society under annexed Poland, it was one of the elements of "organic work", long-term activities covering not only economic issues, but also broadly understood social and cultural ones. They were aimed for the protection of cultural heritage, because they were accompanied by patriotic expectations – regaining independence of the state, whenever convenient conditions would emerged.

A part of gentry was the mainstay of such traditions. It is worth mentioning one significant example – of the important role played by Dezydery Chłapowski, the landowner from Turwia, the region of Great Poland. After taking over the indebted estate from his father, he went to England, where – working on the farm – he learned in depth the best agricultural practices of that time. After returning, he successfully implemented them in his land estate. Then, he propagated them practically by educating about 80 farm managers. In this way, he initiated a specific school of modern agriculture [4].

Voluntary agricultural organizations A significant role in the system of support for rural development and agriculture played social organizations, voluntary and emerging in a bottom-up way. Very often they were for the chambers of agriculture a kind of their executive apparatus: "In principle, all direct activities on the dissemination of agricultural progress were carried out by county associations of agricultural circles, by initiating works in agricultural circles, industry associations and circles of rural housewives, or supporting work in ... the circles of rural youth." [16].

As early as 1810, a Business and Agricultural Association was established in the territory of the Russian partition. Liquidated after only two years, revived operations in 1858, to be liquidated again by the Tsarist authorities. It was not until 1907 that the Central Agricultural Society was established. In Lvov, the Austrian partition, in 1829, the Galician Agricultural Society was established, which – under the name of the Eastern Minor Polish Economic Association – survived until the outbreak of the war in 1939.

A bit later, in 1836, the Agricultural Society began its works in Gniezno, in the area of the Prussian partition.

In 1918, immediately before regaining independence, there were 862 agricultural circles in the Prussian partition, 1882 – in the Austrian partition and 1899 – in Russian. In the last years of the interwar period, the Central Society of Organizations and Agricultural Circles with headquarters in Warsaw operated and four other independent regional associations gathering together voluntary agricultural organizations. It is estimated that they covered around 14% of all farm owners. There were, however,

significant differences between regions: from 48% in Pomerania to 5% in the Vilnius region and only 2.5% in Polesie.

In the rural environment, there were generally high prestige industry associations, such as the Association of Cattle Breeders, or the Association of Planters of Sugar Beet.

Another important form of self-organization of local communities was the cooperative movement, the most developed in the second half of the nineteenth century in the Prussian partition. Banks played a major role in this movement, not only economic one but also important for conservation of national feeling and social activists such as Father Piotr Wawrzyniak played a great role in it [23]. During the interwar period, the cooperative movement developed further, but not in a territorially evenly manner.

In the years 1938-1939, the largest in number were (3,707) credit and agri-food cooperatives (3,207). Dairy cooperatives (1,475) also played an important role. In addition, 454 agricultural and trade cooperatives were registered.

However, nationwide structures were not developed during that period, as well as the unification of agricultural education. To establish a nationwide representation of agriculture, a resolution of the Central Congress of the Society of Organizations and Agricultural Circles of March 1936 was unanimously adopted – but that postulate remained only on paper.

In addition, socio-economic organizations competed with each other for influence and were politically diverse. The conflict between the interests of landowners and small-farm associations was particularly significant. Rural youth was also associated in several organizations with a different ideological and political profile, such as the Central Union of Rural Youth "Siew" [“Seeds”] and the Union of Rural Youth of the Republic of Poland [16].

Social agronomy and practical implementation of this concept The term "social agronomy” was used in the title of the book by the Russian author Tachaianov (1888-1937). In Poland, W. Grabski, an agricultural economist and politician began to use it in 1928 (he is especially known as the author of the currency reform of 1924, when the Polish mark was replaced by the złoty). According to his definition, the social agronomy is: “a social activity, based on a private initiative, or on associations, or on institutions, or on local government and the state, consisting in dissemination of agronomic knowledge and its application by the broadest classes (from priests to peasants, inclusively)”. It is therefore a coherent system of socio-professional agricultural education and upbringing in the spirit of making an active attitude to life. Thus, it concerns both the sphere of agricultural production and social relations: cooperation of various economic institutions (such as rural cooperatives or agricultural circles) and socio-cultural ones (for example, youth associations and rural housewives' circles). Therefore, at the focusing point was the man as a subject. Emphasis was placed on shaping the teamwork habits [16].

This concept was connected with two directions of agricultural education – the development of agricultural extension service and extramural agricultural courses. One of the important elements of these activities was the dissemination of agricultural knowledge and progress – agricultural innovations covering all the rural environment. Therefore, social agronomy, as a tool of spreading innovative methods in agriculture, was a construction based itself on three pillars: agricultural sciences and education, agricultural organizations and associations framework and agricultural producer's network.

University level research and education were conducted in one Agricultural University, the SGGW of Warsaw and four Agricultural Faculties at Universities in Cracow, Lvov, Poznań and Vilnius with total number of graduates of around two thousands. Thus, the concept included previously established institutions, and also used former experience. Its important new structural element were the chambers of agriculture.

Significance of agricultural chambers Agricultural chambers were the most important institution of agricultural self-government. Their beginnings on Polish territories date back to 1894, when the Prussian authorities issued a bill under which the Agricultural Chamber in Poznań was established – its first meeting took place in February 1896. As a result of the victorious Greater Poland Uprising in January 1919, it passed into Polish hands. Under the ordinance of the Minister of the former Prussian district – from the beginning of March 1919 – the chamber obtained the right to organize lower agricultural schools and other similar institutions, as well as the right to control these schools. In the Constitution of the Republic of Poland, adopted on 17-th March 1921, a provision was made (Article 68) on the establishment of a future separate act of economic self-government, including agricultural chambers and, moreover, craft, commercial and industrial ones, associated in the Supreme Chamber of Commerce. The first all-Polish act regarding the activities of agricultural chambers was the President's Regulation of March 1928, announcing their establishment throughout the country. Nevertheless, attempts to introduce homogeneous structures of agricultural chambers in the whole of Poland had failed. Thus, agricultural chambers covered the area of one province.

The basic tasks of agricultural chambers included:

-representing and defending the interests of agriculture;

-undertaking independent initiatives in the field of comprehensive support of agriculture and

-performing the tasks entrusted to them – especially in the field of establishing and running agricultural schools, agricultural experimentation and consulting.

In the interwar period of Poland, 26 agricultural enterprises were involved in experiments – 16 of them belonged to the agricultural chambers. An interesting form of experimental work by the chambers of agriculture were "experimental circles", voluntary associations from a few to a dozen farmers, conducting a close experiments in their farms. They received subsidies from the Ministry of Agriculture and agricultural chambers. During a period 1926-1938, 84 such experimental circles were created. In addition, agricultural schools run by agricultural chambers participated in the experimentation in Pomerania and Greater Poland.

An important form of support for progress in the methods of farming by agricultural chambers was the organization of "leading farms". These were teams of 4-5 farmers who, as local leaders, undertook various initiatives in their environment, for example in the field of collective management of meadows and pastures [1].

In 1935, the Association of Chambers and Agricultural Organizations was established, bringing together 13 regional Chambers of Agriculture. A year later, the Rural Culture Institute was established, conceived, among others as an advisory and auxiliary body of government administration [16].

Coordination of all agricultural tasks was the responsibility of the Ministry of Agriculture and Agricultural Reform. The intermediary body between the territorial self-government and the central level of state administration was the economic self-government, including the chambers of agriculture. Voluntary socio-agricultural associations at the local level were involved in the “work from the bottom”.

Agricultural extension In the period discussed here, as many as 2/3 of the total population relied on agriculture. The overpopulation of rural areas was particularly severe in the South-Eastern part of the country. Activation of agricultural production was not conducive to farm fragmentation – 64% of them did not exceed 5 ha. The principles of modern agriculture, developed in the nineteenth century, therefore required translating into a farm-gate level.

The beginnings of today's adviser, or how it was described at that time – an agricultural instructor – goes back to 1860. when the Royal Danish Agricultural Society appointed the first consultant for dairy sector. In the

Polish lands at the earliest, at the end of the 19th century, agricultural instructors appeared in the region of Greater Poland. They were so-called itinerant teachers engaged by the Agricultural Society. In the 1920s, after regaining the independence, three pillars of advisory services can be distinguished:

a)agricultural instructors dealing with the issues of peasant farms and its modernization;

b)instructors for rural household and educational work among women;

c)instructors supporting rural youth.

In 1935, a total of over 1,500 instructors were employed in all 241 counties. They were supported by the staff of agricultural chambers and rural cooperatives as well as teachers of agricultural schools. Thus, approximately three thousand professionals dealt with the instructor's work for rural societies, a great success for the then realities. The basis for the staff distribution were county agricultural instructors varied in the number from five to ten. As early as in 1918 they established Union of Instructors of Rural and Social Work, counting 130 members in 1921 and publishing for some time even their own journal, "Głos Instruktorski" ("Instructor's Voice").

The first school that educated instructors and teachers of agricultural schools was the State School of Rural Economy in Cieszyn. A few years later, in 1927/29, the specialization of social agronomy was created at the Main School for the Rural Economy, the SGGW in Warsaw. For the purpose of education, the Social Agronomy Department at the Faculty of Agriculture was established, the first scientific and didactic unit of that type in Europe. In addition, since 1929, the Central Office for Upgrading Agricultural Instructors at the Museum of Industry and Agriculture was involved in teaching activities and, since 1933, the Central Commission for the Training of Instructors at the Central Society of Organizations and Agricultural Circles [13].

The mission of the agricultural instructor was to inspire the rural environment so that it would be able to act and develop on the basis of its own strength. One of the practical ways to implement these assumptions was to organize model farms. It usually started with group visits of farms belonging to members of farm circles, during which advice was given on improvements to farming practices – such actions were taken at the earliest in Greater Poland and then covered other parts of the territory. The adopted method of operation was mainly based on the principle: "example – implementation". Thus, the institution of the leading farm was shaped by practice, to a large extent by method of trial and error.

The farms targeted to be the leading ones were selected by county instructors. The instructor appreciated as a partner enlightened and entrepreneurial farmer and, at the same time, enjoying respect in his environment. Around such a farmer, who was the owner of the leading farm, a cluster of several other farms was formed, usually belonging to the best farmers in the village. The range of territorial impact in "breadth" and "in depth" was increased by the creation of the network of the leading farms. Therefore, over a dozen leading villages such as Lisków, Albigowa and Cupryły were emerged throughout the country. Each of them was often the purpose of peasant exploration tours. The aforementioned actions were supported by the Ministry of Agriculture, in which a Committee of the Organization of Small-scale Farms was established in 1934. Among others, it was to elaborate the rules of organization, including the methods of cooperation between leading farms and agricultural chambers. The solutions discussed here belong to the long-term achievements of the agricultural advisory services of the interwar period, which were squandered by the wartime and its subsequent political consequences. That is why they are worth to be remembered today.

Some difficulties faced by the instructors also have to be to mentioned as they sound also quite contemporary. One of them was wage issues. The wages were paid irregularly. Before 1-st April, the first day of the new budget year, there were some dismissals resulting from shortages in county budgets.

Often, agricultural instructors did not have a paid-up pension fund [16].

People's Poland (1944-1989). Split: collectivization vs. peasant farming support

In the conditions of the war destructions and massive migrations due to the changes of borders, one of crucial issues was the food security and, at the same time, installation of the forced political system. Therefore, the years 1944-1948 were transient. The reconstruction was accompanied by reactivation of many pre-war institutions, including agricultural chambers, and cooperatives. In the conditions of acute staff shortages – many advisors were killed, some stayed outside the borders, and those remaining in the country were often promoted to much higher positions – three districts were formed, grouping together several provinces: the Pomeranian Training District; the Cracovian Training District and the Warsaw Training District. An uniform training programme for advisers was applied. In this way, 453 instructors were trained until 1947, that is about 43% of all the staff. During a period 1946-1948, agricultural advisers were employed in the two categories: instructors for farm organization or instructors for rural households. Because for one adviser from each of these categories there were about 45 thousand farms with an acreage of more than 2 ha, other tried pre-war patterns were applied – leading farms and leading villages. The institution supporting the revitalization of the village were reactivated agricultural chambers [20].

With the strengthening of the new regime, there had been a growing trend of centralizing social and economic life and elimination of bottom-up independent social structures. At the turn of 1946/1947 agricultural chambers were liquidated. The campaign of the "battle for trade" was accompanied by subordination of the cooperatives to superior central structures – in the case of rural areas it was the Peasant Self-help Union. At the end of 1948, took place – like in other countries of the Soviet block – the imposed turn of the socio-economic strategy relying on the forced collectivization of agriculture and rapid expansion of industry, especially the heavy one.

Adopted at that time, a reorganization of agricultural service served as an implementation tool of doctrinal assumptions. Part of it was subordinated to the management boards of agriculture at the voivodship and county level, and the rest was transferred to the political and economic departments of the State Machine Centers. The imposed duty of these services was the obligation to participate in the collectivization campaign and to persuade peasants to join the production cooperatives. Farmer's associations and branch unions were also liquidated. During this period, the previous experiences and traditions of agricultural advisory and self-organization of rural communities were largely squandered.

Correction of agrarian policy took place during the "thaw" of October 1956, along with the change at the top of the ruling party. The majority of agricultural production cooperatives, created under pressure, had been self-dissolved. Agricultural circles resumed their activity, but they no longer had their former role as a bottom-up structure – their main role was to modernize farms mainly by providing them with mechanization services. In 1957, agricultural instructors were transferred to the administrative structures of agricultural councils. Then, the position of the agronomist of the district was created (it included several of communes). He was formally an employee of a County Association of Agricultural Circles, hence his the main duty was to carry out his employer's instructions, consisting in setting up agricultural circles, organization of meetings and performing various administrative tasks [14].

Moreover, in those years, District Agricultural Experimental Units, subordinated to the agricultural departments at the provincial level, were established. Within their framework, specialist consultants were appointed. They were obliged to undertake experimental and implementation activities. Their consulting work included such forms as: demonstrations, farm visits, exhibitions and

trainings. However, in a centralized administrative management system, inspectors were guided by all the authorities of various levels, not always aware of the realities of agriculture and sometimes inconsistent. Lack of coordination of various decision-makers was not conducive to the effectiveness of undertaken actions, and being even source of chaos. Therefore, in 1968, the next changes were introduced. Agronomists, employed by agricultural circles, went to work in the Commune Councils, along with many other advisers from the agri-food industry, dairy cooperatives or associations. However, the methods of operation remained the same – the unconditional execution of top-down guidelines was in force leaving little room for strictly advisory activities.

Along with this, there were further changes in the organization of agricultural advisory services. Agronomists and zootechnicians were replaced by municipal agricultural instructors. The basic composition of the municipal agricultural service team was composed of: rural farm instructor, rural construction instructor, instructor for agro-amelioration, and – depending on the local conditions – such specialists as for orchards, vegetable growing, or sheep farming. According to formally written rules, the agricultural service should perform advisory, organizational, educational, and social-education functions. However, in practice, the agricultural service was still overloaded with administrative tasks, often replacing other institutions appointed to cooperate with agriculture.

Subsequent changes in advisory services organization took place in 1975, when in the administrative structure of the country counties were liquidated and the number of provinces was increased from 17 to 49. District Agricultural Experimental Units had been converted into the Provincial Centres for Agricultural Progress. The actions taken at that time meant some advance in bringing consultancy closer to farmers – the needs of farmers began better recognized and new technological solutions implemented more effectively. Each of such a Centres run its own agricultural farm and its acreage varied significantly from 150 to even 4,500 hectares [10].

Agricultural advisory services (1989-nowadays): system transformation and European integration

The fundamental difficulty in the functioning of advisory services of the socialist period was the inconsistency of agricultural policy. Significant support was received by the nationalized agriculture, preferred by the state despite the fact that they gave way to peasant farms in terms of effectiveness. Under the system of the Centrally Planned Economy, private property was treated as an alien, unwanted body. During the 1970s, in spite of some important pragmatic solutions inserted by the E. Gierek regime (introduction of a pension scheme and general public health system for farmers and removal of archaic compulsory purchasing system), the policy of collectivizing agriculture was still carried out, albeit in milder and more hidden forms – there were administrative directives so that the land transferred by farmers to the state treasury was no longer available for sale to other interested farmers (it was transferred to an artificial structure, Joint Farms of Agricultural Circles, often with negative economic outputs). Only under conditions of a peaceful revolution, under the pressure of the agricultural "Solidarity", the stability of peasant farming in the system of socialist economy was guaranteed by a Parliamentary law. This time, unlike the earlier ones, due to the terrible and deteriorating economic situation, these records were respected.

Compared to other socialist countries, the specificity of 1980s Poland was characterized by an economic decline, but at the same time a greater scope of political freedoms. These circumstances decided in 1989 about the adoption of a strategy of system transformation. Radical economic reforms, described as a “shocking therapy” and known from the name of their architect as a “Balcerowicz reform package”, were accompanied by much more slower political transformation.

The new situation in agriculture consisted of: liberation of prices, suppression of the hyperinflation that occurred at that time, liberal policy in foreign trade, resulting in an easy access of subsidized in the European Communities agricultural commodities to the Polish market (with simultaneous restrictions on the access of Polish products to the European market) and economic collapse of the state farms.

The "economy of shortages", typical for the socialist economy [12] was quickly replaced by the abundant offer of goods on the food market. The first time for many decades, a farmer learnt that manufacturing of a product in his farm constitute only a part of his interests – at least of equal importance is just to sell it.

At the beginning of the 1990s, in the new system reality, subsequent changes in agricultural advisory services took place. Using the existing material and personnel base, Provincial Centers of Agricultural Progress, had been replaced by Provincial Agricultural Advisory Centers. Reformed system was focused on the needs of private farmers. Changes in the agricultural advisory organization included, among others:

-establishment, since 1991, of the Social Advisory Councils;

-withdrawal from the production activity (resignation from running own farms) – they became units financed from the public budget;

-subordination to the Voivode (the province governor) as funding authorities. Appointing directors through open competitions.

Budgetary difficulties, as well as competition from private advisory units, resulted in the introduction of partial payment for some consultancy services (this applies in particular to filling out applications for the EU subsidies or preparing business plans). One of the achievements of changing the mission of state advisory services was acting in accordance with the principles of grassroot development, taking into account the previously recognized needs of farmers and rural communities instead of fulfillment of top-down directives under the former political regime [22].

Introduced in 1999, changes in the administrative division reduced the number of provinces from 49 to 16 and restored counties as an intermediate level of public administration. They also caused changes in the structures of agricultural advisory services. Under the law adopted by the Parliament, agricultural advisory centers obtained legal personality and were subordinated to Marshal Offices, the voivodship self-government structures, with their co-financing from the state budget made via the Voivode as a regional representative of the state authority. The solution was controversial because of a certain two-partism. In the autumn of 2016, after eight years of government of D. Tusk (today's President of the European Council), the power was overtaken by the opposition party "Prawo i Sprawiedliwość' ("Law and Justice"). Under the provocative slogan of "a good change", another centralistic and anti-European policy has been enforced. Provincial Agricultural Advisory Centres were overtaken by the Voivode Offices with resultant "tsunami" in staffing of managerial positions – all directors of the Provincial Centers have been removed from the posts, as well as a significant part of the lower management staff.

The work and scope of activities on the Provincial Agricultural Advisory Centre can be illustrated by an example of the Warmia-Mazury Agricultural Advisory Centre in Olsztyn. In 1990, the Voivodship Agricultural Progress Centre was located in Bęsia, in rural areas – following the reform that was adopted. It was then transferred to more easily accessible Olsztyn, the centrally located capital of the province. The Centre works for one of the less densely populated provinces but with well-recognized values of the natural environment (vast forests and the "land of thousands lakes"). In the former political regime, agriculture was dominated by state-owned farms. Therefore, there are larger family farms and a remarkable number of large-scale commercial ones. In the province, the average farm size is the highest in the national scale (2.3 ha vs. 10.7) and some of

2/3 of agricultural land is cultivated by farms above 30 ha [5].

As the first in the country, already after submitting in 1994 the application for the EU membership, the Centre undertook systematic propagation and training activities related to broadly understood European integration. Training activities cover not only farmers, but broadly understood strata of the rural population, including school youth. Since 1995, one of important areas of activities is development of agro-tourism. There is permanent cooperation with the Warmia and Mazury University (former Agricultural University) in Olsztyn. The publishing activity is carried out on an ongoing basis, including its own monthly "Bieżące Informacje" ("Current Informations"). In 1994 for the first time "Wama Agro Food" was organized and, one year later, horticultural "Uniflora". Then their number increased by, among others "Autumn Agricultural Fair", "Everything for a Farmer" and "Warmia-Masurian Exhibition of Farm Animals". For more than twenty years, the Center has been inviting all those willing so to its gates for "Open Days".

Already in 1993, cooperation was initiated with the Kaliningrad Oblast of the Russian Federation, bordering the region. A year later, in the field of cattle and dairy farming, a co-operation with a Danish consulting center in Skejby was established. Other foreign partners worth to be mentioned are France and Ukraine [17].

The Centre supports organization of the agricultural producer' groups (dairy, swine, poultry, cereals, horticultural and others) and assists farmers involved in agro-environmental programmes, including organic farming.

Activities for innovations The system of disseminating knowledge and agricultural innovations in Poland includes Agricultural Advisory Centers, Agricultural Chambers, local associations and organizations (NGOs) and state agricultural Agencies: the Agricultural Market Agency and the Agricultural Property Agency (merged, in 1-st September 2017, in the National Agricultural Support Centre) and the Agency for Restructuring and Modernization of Agriculture. The flow of agricultural knowledge and innovations, in which Agricultural Advisory Centers perform a significant role, includes various forms and activities:

-organizational and economic (including subsidies from the EU budget);
-marketing;
-cooperatives and farmer group actions;
-production technologies;
-agro-environmental (including organic farming);
-cultural heritage.

Agricultural Advisory Center in Brwinów is an institution for "training agricultural consultants, agricultural school teachers, representatives of agricultural institutions and organizations, local governments, Local Action Groups, farmers and residents of rural areas, organizing trainings, seminars, conferences, competitions and other forms of professional development". It is a state organizational unit, subjected directly to the Minister of Agriculture and Rural Development and having Branches in Krakow, Poznań, Radom and Warsaw [15]. In addition, universities and research institutes as well as other implementation units also contribute into these processes.

Particularly prominent results of Agricultural Advisory Centers' work include:

-implementation of legal solutions related to the Common Agricultural Policy;
-assistance in elaboration of the business plans;
-implementation of the system of agricultural accounting (the FADN);
-support of agro-tourism activities and other forms of non-agricultural sources of additional incomes;
-activities for the protection of the natural environment (agro-environmental programmes, local garbage utilization units, alternative energy sources, etc.);
-cooperation in creating local development strategies and reviving social activity of local communities;

-the traditional involvement is the promotion of new agricultural technologies.

Therefore, the scope of interests and actions undertaken by Agricultural Advisory Centers goes beyond the narrowly understood agriculture [11].

The European Innovation Partnership (EIP)

In the earlier part of this work, the achievements of entire previous generations concerning the introduction of innovativeness in agriculture were briefed. The constraints that hinder this process were also well recognized: the specificity of agriculture as such, a shortage of financial resources, deficiencies in the level of education, or fears of change, especially among older farmers. The contemporary proposal for solving the problems indicated here is the European Innovation Partnership, undertaken in recent years. This programme is one of the practical forms of implementation of the EU strategy "Europe – 2020 ", in which, among others, it was assumed that the basis for the development of the EU economy is to increase its innovativeness by creating a single innovation market. The European Innovation Partnership (EIP). It covers a variety of thematic areas, such as active and healthy aging of societies, water resources, raw materials, and smart development of cities and societies [21].

Since 2012, the next venture, the European Innovation Partnership – AGRI is introduced for the development of competitive and sustainable agriculture and rural areas. Supporting innovations in agriculture is focused on:

-more effective resource management;
-reinforcing the ecological economy;
-protection of biodiversity;
-development of innovative products;
-food quality.

EIP is a kind of platform with which innovative farmers have the opportunity to find partners with similar aspirations, to establish and strengthen cooperation and to exchange knowledge and experience on innovation in agriculture [18]. Information about its activity is spread by a monthly newsletter "European Union Partnership – Agricultural Productivity and Sustainability", available online. In its issues, among others information, it can be found news about upcoming events and announcements about organized research projects.

The institutionalized form of such cooperation is the creation of Operational Groups, which include not only interested farmers, but also agricultural farmers, scientists, or agricultural entrepreneurs. According to the data for March 2018, around 600 such Groups operated or started their activities in the entire Union. Examples are "ArboNovateur" in France, grouping fruit producers looking for sustainable and innovative methods of fruit cultivation, in particular exploring irrigation systems and management methods assisting apple, plum, grape and kiwi growers or "UNDERCORK", the Portuguese Operational Group bringing together cork oak growers.

In the national and regional Rural Development Programmes, adopted for 2014-2020 (the seven-year planning period in the Union), a total of over 3,200 such Groups are assumed to be established [6].

The domestic response to these pro-innovation activities undertaken by the Union is the SIR – a network for innovation in agriculture and in rural areas. It covers different institutions focused on the improving the implementation of agricultural innovations. The central unit at the national level is the Agricultural Extension Center in Brwinów, coordinating activities at the regional level, undertaken by Voivodship Agricultural Extension Centers (the WODR). In each the WODR, a Liaison Officer is appointed, to whom all interested farmers or enterprises can turn in order to find partners for intended undertakings or to get required information. The Operational Groups are the bottom-up structures directly related to the implementation of innovations. They are created for the implementation of specific innovative objectives – solutions developed by them are addressed to a specific group of recipients and are a response to their needs. Their composition includes entities classified as:

-Category A: farmers, foresters, entrepreneurs from the agri-food sector, or acting for these sectors;
-Category B – covering the territorial units of local government, consumer and industry organizations operating in the agri-food sector as well as entities providing consultancy services and scientific units.
The Operational Groups obtain legal personality, which enables them to enter into contracts and undertake other obligations. They may also raise funds for their financial activities under the EU Rural Development Programme, the "Cooperation" activity, covering the years 2014-2020 [19].
This network has been operating in Poland since the second half of 2015. The designated Liaison Officers, who are advisors to the individual WODRs, hold working meetings, usually taking place in Brwinów.

CONCLUSIONS

Agricultural extension in Poland. Retrospection and prospects

Linking together research, education and innovation in agriculture is not something new – it dates back to the beginning of the 19th century, when the dynamic development of agricultural sciences was accompanied by the growing importance of transferring their results into practice. Despite the diversity of the political and social situation in the Polish territories, being under the partitions, the beginning of education at the agricultural university-level are dated for the first decades of the 19-th century, following of which development of professional agricultural literature is observed. Some decades later, the profession and ethos of agricultural adviser had been formed and a number of local social and economic associations emerged, being a good example of the grassroot development.
After the regaining in 1918 the independence, the interesting concept of the “social agronomy was introduced to spread innovative agricultural methods into the practice in the vast context of local societies. A network of agricultural chambers was developing as a form of economic self-government, with the support of which experiments were carried out in collaborating farms. "leading farms" were also co-organized to demonstrate agricultural innovations in their rural environment. A web of leading farms led to the creation of "leading villages". This rich heritage was in large degree wasted after the 2-nd world war, while the centralized socio-political system of socialism was imposed – agricultural advisory services were subordinated to ideological goals.
Since 1989, departure from socialism was, therefore, a turning point. Transformation and European integration processes basically changed various areas of socio-political life of the country, including the system of consultative services.
The strengths of public agricultural advisory services include: their legal personality, support from the state budget and the availability of experienced staff, knowing rural realities, well developed territorial structures and a relatively good material background. As examples of their achievements one can cite:
-enforcement of the Common Agricultural policy regulations (including procedures to get the EU subsidies);
-implementation of the farm accountancy (the FADN);
-support in agricultural practices for agro-tourism, organic farming and pro-ecological measures;
-contribution to the development of producer’s groups.
They have also their part to the revival of social activity of local communities and the increase of their ecological awareness.
The change of the system and related economic conditions resulted in the disclosure of a number of weak points, as well:
-due to reductions in running their own farms, ”residual” participation in experiments, which weakens ties with science;
-political fluctuations and numerous reorganizations with the accompanying changes in the management staff;
-changes in the organization of agricultural universities, in the names of which, as well as their faculties, disappeared or was hidden the

word "agriculture" – this has affected the content of their teaching curricula;
-uniform organizational structure but diversified regional conditions – in particular, lack of sufficient preparation to address the problems of large-scale farms;
-reduced importance of apprenticeships of students, lower professional qualifications of graduates (as compared with former decades);
-low wages – limited inflow of new cadres, departure of young people after obtaining some professional experience.

Certainly this list is not a full one. A large part of the advisory work is dealt with issues related to the fulfillment of various EU applications. "These activities have distanced employees from typical technological consultancy – one of the advisers complains – those starting work after 2004 (Poland's accession to the EU) ... are usually specialized in aid programmes". Introduced restrictions in the limits of car trips meant that "advisors remain to work behind the desk to await for a client" [2].

Challenges facing agricultural consultancy result not only from changes taking place in Poland after the fall of socialism. The modern world has been changing dynamically, affecting agriculture and rural areas. The issues of insufficient agricultural income and the search for alternative sources of revenues, the aging of the rural population or depopulation of rural areas have been known for a long time. However, new threats appeared that demand quick responses: preventing climate change, seeking renewable energy sources, and protecting species diversity and water resources.

That is why it is increasingly important to exchange mutual experiences and to cooperate in finding the best possible solutions for these and other problems, both on a local, national and international scale.

REFERENCES

[1]Bernacki, A., 1995, Koncepcje organizacji izb rolniczych w Polsce. Rys historyczny. Wieś i Rolnictwo, 4: 146-159.

[2]Borczyński, P., 2011, Doradztwo państwowe – historia i specyfika, Hasło Ogrodnicze, 6: 14-17

[3]Brzozowski, S., 1997, Nauki o gospodarstwie wiejskim, [in:] Historia nauki polskiej, Vol. 3 (ed. B. Suchodolski), PAN, Warszawa: 517-546

[4]Burny, Ph., Gaziński B., 2015, The EU membership vs rural development. A case study of Eastern Poland, [in:] Strategie gospodarcze i społeczne Unii Europejskiej (ed. Opolski K., Górski J.), Wydział Nauk Ekonomicznych Uniwersytetu Warszawskiego, Warszawa: 197-206

[5]Chłapowski [Dezydery]: Żołnierz, rolnik, obywatel. Available online: https://nowahistoria.interia.pl/drogi-do-wolnisci/news-dezydery-chlapowsi-zolnierz-rolnik-obywatel,nld1856912#utm_source=paste&utm_campaign=chrome (Retrived in August 2018)

[6]Collaborate to innovate. Operational Groups networking across the EU, European Commission 2018 https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-brochure-operational-groups-collaborate (Retrived in August 2018)

[7]Davies, N., 2011, God's playground: a history of Poland, Vol. 2, 1795 to the present, Oxford University Press

[8]Gaziński, B., 2016, Poland recast. Agriculture and rural development during a period of the transformation and European integration. An overview, "AgroLife. Scientific Journal", Vol. 5(1): 69-82

[9] Gaziński, B., 1991, Prawidłowość przemian w rolnictwie. Wprowadzenie do ekonomiki rolnictwa, Wydawnictwo ART, Olsztyn

[10]Kania, J., 2017, The beginnings and development of agricultural advisory services in Poland. Acta Sci. Pol. Oeconomia, Vol. 16 (2): 77–85

[11]Kania, J., 2007, Doradztwo rolnicze w Polsce w świetle potrzeb i doświadczeń zagranicznych, Zeszyty Naukowe AR Kraków, Vol. 440, Rozprawy, 318: 201

[12]Kornai, J., 1980, Economics of shortage, North-Holland Publishing Company, Amsterdam

[13]Maziarz, Cz., 1984, Andragogika rolnicza, PWN, Warszawa

[14]Michałowski, Cz., Szafrański, L., 1993, Wybrane zagadnienia doradztwa rolniczego, Wydawnictwo Akademii Rolniczej, Lublin

[15]O nas. Available online: http://www.cdr.gov.pl/o-nas (Retrived in August 2018)

[16]Pawlikowski, W., 1975, Agronomia społeczna. Cz. I. Rozwój agronomii społecznej w Polsce w latach 1918–1939, PWN, Warszawa

[17]Pilarek, B., 2016, Doradztwo rolnicze na Warmii, Mazurach i Powiślu, Wojewódzki Ośrodek Doradztwa rolniczego, Olsztyn

[18]Sieć EIP-AGRI 2015, Komisja Europejska 2015. Available online: http://agroinnowacje.eu/wp-content/uploads/2017/06/EIP-AGRI-network-polish-web.pdf , Accessed on August 10, 2018.

[19]Upowszechnianie innowacyjnych rozwiązań rolnictwa precyzyjnego w gospodarswacgh rolnych. Broszura poseminaryjna, 2017, WODR Olsztyn

[20]Wawrzyniak, B., 1980, Służba rolna w Polsce, LSW, Warszawa

[21]Wiatrak, A. P., 2016, Sieć innowacji w rolnictwie – istota, cele i uwarunkowania, Roczniki Naukowe SERiA, Vol XVIII (3): 380-384
[22]Witeska, E., 1995, Problemy doradztwa rolniczego w Polsce. Uwarunkowania przemian organizacji rolnictwa, Wieś i Rolnictwo, 4: 194-205
[23]Wojciechowski, S., 1939, Historia spółdzielczości polskiej do 1914 roku, Spółdzielczy Instytut Naukowy, Warszawa

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE EVOLUTION OF AVERAGE PRICES FOR AGRICULTURAL PRODUCTS IN ROMANIA DURING 2007-2017

Gabriela GIMBĂȘANU, Valentina TUDOR

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Emails: gimbasanugabriela@yahoo.com, valentina_tudor@yahoo.com

Corresponding author: gimbasanugabriela@yahoo.com

Abstract

This paper analyzes the evolution of the average price for agricultural products in Romania, as compared to the evolution of cereal prices in the European Union, in order to highlight the price differences as well as the causes that generate these differences. Also, this article will highlight the most suitable moments for valorising wheat, barley, corn production. In this paper we have proposed to analyze the evolution of average prices of agricultural products in Romania during the reference period 2007-2019 in order to identify in what trends are the best prices of the year in which the cereals can be sold and what extra income farmers can get by selling grain at the right time when market pressure is low and demand is high.

Key words**:** *average prices, grain trade, oilseed trade*

INTRODUCTION

In terms of size, Romania ranks second in the European Union. The total area of 238 thousand km² of our country accounts for 6% of the total area of the European Union. Romania's agricultural potential is still insufficiently exploited. Despite the transformation of the Romanian rural area under the imminence of the two National Rural Development Programs, the population migration from the rural area to the urban area has not yet been stopped. Even if we have quite a lot of young people who have decided to settle in the countryside to start an agricultural business, there are even more young people leaving the Romanian village. [2] [5]

The success of the Romanian farms is directly dependent on the sales price that farmers receive in capitalizing on agricultural output. The price of cereals is often influenced by the quantity harvested at national level, but also by the time the farmer decides to capitalize on his production. Whether in the wheat, barley and corn market, Romania is present almost all year round with storage facilities on Romanian farms in respect of oil products: rapeseed and sunflower Romanian farmers are present only in the seasonal harvest market, since the storage of these cereals requires the existence at the farm level of a specific storage infrastructure, incurring a series of additional costs [3] [7] [11].

The cereal market in Romania represents the total amount of grain transactions that have at its center the farm and the farmer. Both the farmer, exporters, port operators, lawyers, local and regional authorities, transporters, livestock consumers, and processing industries are meeting on this market. [4] [12]

Cereals are raw materials of agricultural origin and are of particular importance in world agriculture, as they play an important role in human nutrition and are also a basic element in animal feed ration. Worldwide, grain transactions are dynamic and represent over 10% of the world trade in agri-food products [1] [8] [10]

World consumption of cereals and oilseeds has grown in recent years, driven by the evolution of the population. Wheat represents 31% of total cereal consumption globally. Among the world's largest grain consumers are: the European Union, Egypt, Iran, Mexico and Brazil. On the other hand, rice also is on a leading position in the ranking of the most

consumed cereals, accounting for 21% of the world's grain consumption. [1] [6] [9]

MATERIALS AND METHODS

This paper was developed on the basis of the statistical data generated from the European database - Eurostat, analyzing the sale price of the main cereal products (wheat, barley and corn) as well as of the main oil products (rape and sunflower).
Also, for the relevance of the analysis, absolute (fixed and chain basis) indices and relative indicators such as dynamic index, dynamic dynamics, absolute value of a percentage of the change rate were used. At the same time, quantitative and qualitative method was used to analyze the mentioned data.

RESULTS AND DISCUSSIONS

Analyzing the price of the main wheat-producing countries in the European Union during 2007-2017, it is noted that the best price was obtained in 2013 when European Union (EU-28) wheat production was recorded a wheat production of 143.51 million tonnes of cereals. In that year, the best prices were obtained in the UK with 21.95 euro/100 kg, the Czech Republic with 20.36 euro/100 kg. The Romanian farmers were also rewarded for the production obtained with a sales price of 100 kg of 19.24 euro (Table 1).

Table 1. The evolution of the sale price of wheat in the main EU countries in the period 2007-2017 (euro/100 kg)

Country	2007	2010	2013	2014	2015	2016	2017	2017/2007	2017/2013	2017/2016
Sweden	18.74	16.99	19.53	16.32	15.10	13.54	13.88	-25.9	-28.9	2.5
Croatia	:	:	14.81	15.77	15.23	12.19	13.89	-	-6.2	13.9
Slovakia	16.34	13.61	16.92	14.8	14.63	12.29	13.98	-14.4	-17.4	13.8
United Kingdom	18.82	15.28	21.95	19.31	17.01	14.68	14.01	-25.6	-36.2	-4.6
Hungary	17.39	14.23	16.06	15.62	15.58	12.77	14.02	-19.4	-12.7	9.8
Austria	18.90	18.41	14.84	13.48	13.72	11.55	14.07	-25.6	-5.2	21.8
Belgium	17.74	15.58	19.87	16.48	15.44	13.34	14.14	-20.3	-28.8	6.0
Romania	18.30	14.01	19.24	17.10	16.65	14.03	14.23	-22.2	-26.0	1.4
Czechia	16.49	13.42	20.36	16.27	15.84	13.69	14.51	-12.0	-28.7	6.0
Latvia	18.87	16.34	18.42	15.5	14.85	13.46	14.64	-22.4	-20.5	8.8

Source: Eurostat data processing, accessed 16.03.2019.

In the period 2016-2017, the prices received by European farmers for the wheat were extremely low compared to 2013. Thus, the most significant decreases were registered in Sweden, where farmers received 28.9% less than the price received 4 years ago. The Romanian farmers received a price of 14.23 euro/100 kg in 2017, 26% less than the price received for the same quantity of wheat in 2013 (Table 1).
In contrast, analyzing the prices obtained by European farmers in 2017 as compared to 2016, it is noticed that better prices have been obtained in harvesting wheat production. In Romania, the price obtained for the recovery of 100 kg of wheat was 14.23 euro, 1.4% higher than the price received in 2016. The most significant price evolution in 2017 as compared to 2016 was recorded in Austria where farmers received 21.8% more for the same amount (Table 1). These marked fluctuations in price, from one year to the next, are attributable to worldwide production. As demonstrated, over time, when climate conditions are favorable to agriculture and high yields of wheat, the prices received are low, instead, if the agricultural year is a difficult one and small productions are obtained, then the farmers receive good prices for the capitalization of production (Table 1).
According to statistical data, in the European Union in 2017 58.9 million tons of barley were harvested, Romania recorded a production of 1.90 million tons of barley, while France had a production of 6 times bigger (12.1 million tonnes) (Table 2).
Regarding the barley prices, an average price of 16.85 euros per 100 kilograms was recorded in Romania, while the best price for the same quantity in the analyzed countries.

Table2. Evolution of barley sales price in the main EU countries in the period 2007-2017 (euro / 100 kg)

Country	2007	2010	2013	2014	2015	2016	2017	2017/2007	2017/2013	2017/2016
Hungary	15.07	10.64	15.68	13.98	13.51	11.79	11.69	-22.4	-25.4	-0.8
United Kingdom	16.94	12.39	18.6	14.89	14.41	12.46	11.85	-	-36.3	-4.9
Luxembourg	17.10	12.53	14.7	13.02	14.21	11.30	12.52	-26.8	-14.8	10.8
Latvia	16.7	13.11	16.23	12.96	13.30	12.16	12.68	-24.1	-21.9	4.3
Slovenia	-	10.84	17.73	15.33	13.38	13.30	12.88	-	-27.4	-3.2
Sweden	19.45	14.36	15.95	13.80	13.22	12.43	12.94	-33.5	-18.9	4.1
Belgium	17.96	14.74	17.32	13.9	14.23	11.82	13.22	-26.4	-23.7	11.8
Croatia	-	-	16.55	16.21	15.73	13.15	13.45	-	-18.7	2.3
Estonia	15.42	12.50	16.51	16.5	14.88	12.76	13.56	-12.1	-17.9	6.3
Bulgaria	12.33	10.05	17.09	15.33	15.50	14.07	13.71	11.2	-19.8	-2.6
Lithuania	18.23	12.92	17.78	14.01	14.35	12.83	13.80	-24.3	-22.4	7.6
Poland	16.94	12.31	17.53	15.06	14.63	13.39	14.43	-14.8	-17.7	7.8
Czechia	14.17	12.33	20.82	19.39	16.61	14.91	14.51	2.4	-30.3	-2.7
Denmark	17.76	13.70	19.03	15.09	16.16	13.73	14.79	-16.7	-22.3	7.7
Slovakia	17.02	13.52	19.06	16.65	15.14	13.97	15.36	-9.8	-19.4	9.9
Greece	22.48	16.29	19.6	16.14	16.72	16.20	15.83	-29.6	-19.2	-2.3
Romania	20.10	13.77	23.53	20.25	19.35	17.82	16.85	-16.2	-28.4	-5.4

Source: Eurostat data processing, accessed 16.03.2019.

The lowest barley price was recorded in the UK, being 11.85 euro / 100 kg, 5 euros less than the value received by Romanian farmers (Table 2).

Reporting the value obtained by farmers in barley valorization in 2017 as compared to 2013, there is a significant decrease in price: if in 2013 the price obtained by the Czech Republic in barley valorization was 20.82 euro / 100 kg, in 2017 the price a registered a decrease of 30.3%. Analyzing the same reference period, the Romanian farmers received a price of 23.53 euro / 100 kg in 2013, in 2017 the value of the barley recorded a significant decrease of 28.4% (Table 2).

Tabel 3. The evolution of the sale price of maize in the main EU countries in the period 2007-2017 (euro/100 kg)

Country	2007	2010	2013	2014	2015	2016	2017	2017/2007	2017/2013	2017/2016
Poland	17.42	14.82	15.99	13.02	13.56	12.18	12.80	-26.5	-19.9	5.1
Slovakia	17.14	14.89	17.27	12.87	13.96	12.83	13.50	-21.2	-21.8	5.2
Croatia	-	-	15.4	11.94	12.75	13.57	13.94	-	-9.5	2.7
Hungary	18.20	13.65	16.43	13.44	13.71	13.38	14.12	-22.4	-14.1	5.5
Austria	20.98	17.89	15.06	11.12	14.58	12.65	14.12	-32.7	-6.2	11.6
Slovenia	19.91	15.51	16.92	12.53	13.18	13.06	14.13	-29.0	-16.5	8.2
Lithuania	21.85	18.06	16.68	14.61	14.35	12.32	14.33	-34.4	-14.1	16.3
Czechia	15.07	12.98	19.48	15.43	13.86	14.43	14.36	-4.7	-26.3	-0.5
Bulgaria	14.32	14.16	15.59	14.21	13.99	14.24	14.58	1.8	-6.5	2.4
Romania	23.10	16.86	22.63	17.10	17.10	16.48	14.88	-35.6	-34.2	-9.7

Source: Eurostat data processing, accessed 16.03.2019.

In 2017, 65.1 million tons of grain corn and a mixture of corn and berries were harvested in the European Union. This year, the most important quantities of maize were harvested from France (14.53 million tonnes) and Romania (14.32 million tonnes) (Table 3).

Regarding the prices obtained at the harvesting of maize in 2017, the best price was obtained by Romania, of 14.88 euro / 100 kg, while Poland recorded the lowest price for the capitalization of maize production, only 12.80 euro/100 kg, 2 euro per 100 kg less than the value received by Romanian farmers (Table 3).

Analyzing by comparison the prices received in 2017 as compared to 2016, it is noted that for most of the analyzed countries, the prices obtained had a positive trend, with the exception of Romania where the price obtained in 2017 was about 10 percent lower than that received in 2016 (Table 3).

At the opposite end there is the comparison between the prices obtained in 2017 compared to those obtained in 2007. It can be noticed that the price of maize has a negative trend, most of the analyzed countries received a lower price in 2017 compared to 2007 The only country with an upward trend is

Bulgaria, which received a price of 14.32 euro/100 kg in 2007, while in 2017 the average price was 14.58 euro / 100 kg, increasing 1.8% (Table 3).

Table 4. The evolution of the rapeseed sale price in the main EU countries in the period 2007-2017 (euro/100 kg)

Country	2007	2010	2013	2014	2015	2016	2017	2017/2007	2017/2013	2017/2016
Slovenia	22.03	27.35	35.84	30.75	36.36	32.66	32.01	45.3	-10.7	-2.0
Croatia	-	-	34.1	30.38	34.56	31.58	32.02	-	-6.1	1.4
Netherlands	30.35	31.50	34.25	32.5	33.50	34.00	32.50	7.1	-5.1	-4.4
Austria	33.24	34.94	34.15	29.01	33.48	34.11	32.69	-1.7	-4.3	-4.2
Bulgaria	20.33	27.95	35.48	32.08	34.28	33.64	33.07	62.7	-6.8	-1.7
Sweden	33.38	39.00	36.41	30.89	33.72	35.18	33.80	1.3	-7.2	-3.9
Luxembourg	26.62	30.5	34.15	29.76	34.17	33.69	33.85	27.2	-0.9	0.5
Latvia	27.08	30.82	35.37	29.52	33.53	34.99	34.25	26.5	-3.2	-2.1
Romania	23.70	29.68	35.53	30.16	36.89	34.96	34.58	45.9	-2.7	-1.1

Source: Eurostat data processing, accessed 16.03.2019.

In the period 2003-2018 at the European Union level, the area planted with rape was increased by 66%, from 4.1 to 6.8 million hectares. EU production has reached 20 million tonnes - mainly driven by biodiesel demand (the Renewable Energy Directive). Its by-product (rape meal) is an important source of high-protein feed. The main producers of rapeseed are France, Germany and Poland.

As regards the prices of rapeseed, they have seen an upward trend, determined on the one hand by the increasing demand for this oil plant, both as a renewable energy source and as a widespread use of rapeseed in the feed ration of animals (Table 4).

In Romania, the area planted with rapeseed has grown annually, rapeseed being the crop that brings the first money to the farm every agricultural year. The prices received at the capitalization have fluctuated, determined on the one hand by the international context, and on the other hand by the quantity harvested in the country at the end of the rape season. The best price received was recorded in 2015 when, for 100 kg of rape, farmers received 36.16 euros. At the opposite end, the lowest price was registered in 2007, when the Romanian farmer received 23.7 euros for the capitalization of 100 kg of rapeseed. By comparison, the average price recorded for rape in 2017 was 45.9% compared to 2007 (Table 4).

Looking at the average prices recorded in 2017 as compared to 2016 it is noted that for most of the analyzed European countries, the trend is a downward trend. Exceptions are made by Croatia and Luxembourg, where there is a slight increase in the average price of 1,4% (Croatia) and 0,5% (Luxembourg) (Table 4).

Table 5. The evolution of sunflower sales price in the main EU countries in the period 2007-2017 (euro/100 kg)

Country	2007	2010	2013	2014	2015	2016	2017	2017/2007	2017/2013	2017/2016
Austria	32.56	39.59	29.52	24.51	33.71	30.10	28.39	-12.8	-3.8	-5.7
Croatia	-	-	25.56	23.39	31.76	29.35	29.56	-	15.6	0.7
Romania	25.20	28.25	35.98	28.35	33.74	33.63	29.99	19.0	-16.6	-10.8
Slovakia	34.14	34.67	32.4	27.8	34.34	32.40	31.17	-8.7	-3.8	-3.8
Bulgaria	22.59	27.52	31.05	30.57	35.67	35.61	32.20	42.5	3.7	-9.6
Hungary	34.02	32.83	33.62	31.18	36.34	33.98	32.35	-4.9	-3.8	-4.8
Czechia	26.85	28.32	40.84	30.69	32.59	35.70	33.96	26.5	-16.8	-4.9
Greece	25.00	38.50	40.23	35	35.00	35.00	35.00	40.0	-13.0	0.0
Portugal	32.45	32.50	35.00	33.00	37.50	37.89	38.50	18.6	10.0	1.6

Source: Eurostat data processing, accessed 16.03.2019.

In 2017 the production of sunflower obtained in Romania was 3.167 million tonnes and the average yield per hectare reached the value of 2,725 kg/ha. According to the National Institute of Statistics, counties with a higher share of total sunflower production were Braila (9.5%), Constanta (8.9%), Dolj (8.0%), Olt (6.1%), Teleorman (6.0%). In terms of the area planted with sunflower in 2017, Romania ranks first in the European Union (Table 5).

Regarding the average prices for harvesting sunflower production in the year 2017, the best prices were obtained in countries such as Portugal (38.5 euro/100 kg), Greece (35

euro/100 kg), Czech Republic (33.96 euro/ 100 kg), Hungary (32.35 euro/100 kg) and Bulgaria (32.2 euro/100 kg). In Romania, the sunflower oil price was small, compared to other countries, of only 29.99 euro/100 kg, by 8,6 euro lower than the price recorded in Portugal.

Looking at the prices recorded in 2017 with those obtained in 2007, we notice an upward trend for most of the analyzed countries, so that the most significant price increases are recorded in Bulgaria (42.5%) and Greece (40%). At Romania level, the price increase is only 19% (Table 5). However, analyzing the prices of 2017 compared to those obtained in 2016, it is noted that the trend is predominantly descending, so the most significant decreases are recorded in the countries: Romania (10.8%), Bulgaria (9.7%) and Austria (5.7%) (Table 5).

Table 6. Dynamics of the sales price of wheat for bakery in Romania during 2012-2017 (euro/100 kg)

Year	Wheat	Dynamic index		Dynamic rhythm (%)		The absolute value of a percentage of the change rate	
	euro / 100 kg	with fixed base	with chain base	with fixed base	with chain base	with fixed base	with chain base
2012	20.41	0	0	0	0	0.2041	0
2013	19.24	0.9427	0.9427	-5.7325	-5.7325		-0.0117
2014	17.10	0.8378	0.8888	-16.2175	-11.1227		-0.0214
2015	16.65	0.8158	0.9737	-18.4223	-2.6316		-0.0045
2016	14.03	0.6874	0.8426	-31.2592	-15.7357		-0.0262
2017	14.23	0.6972	1.0143	-30.2793	1.4255		0.002

Source: Eurostat data processing, accessed 16.03.2019.

Absolute fixed base changes are noted in the fact that the sales price of wheat is downwards, with the exception of the year 2016, when it was 14.03 euro / 100 kg, about 31% lower than in the reference year. Reporting each year to the previous one, thus calculating the dynamics of the sales price of bread for bread, we note that the absolute values with the base chain register the highest increase in 2017 compared to 2016 and the opposite is the price recorded in the year 2016, compared to 2015 (a decrease of about 16%). Analyzing the absolute value of a percentage change in the rate of change, we note that the 1% increase in the sale price of bread wheat in any year compared to the reference year is equivalent to an absolute increase of 0.2041 euro / 100 kg (Table 6.).

Table 7. Dynamics of the sale price of rapeseed in Romania during 2012-2017 (euro / 100 kg)

An	Rape	Dynamic index		Dynamic rhythm (%)		The absolute value of a percentage of the change rate	
	euro / 100 kg	with fixed base	with chain base	with fixed base	with chain base	with fixed base	with chain base
2012	41.04	0	0	0	0	0.4104	0
2013	35.53	0.8657	0.8657	-13.4259	-13.4259		-0.0551
2014	30.16	0.7349	0.8489	-26.5107	-15.1140		-0.0537
2015	36.89	0.8989	1.2231	-10.1121	22.3143		0.0673
2016	34.96	0.8519	0.9477	-14.8148	-5.2318		-0.0193
2017	34.58	0.8426	0.9891	-15.7407	-1.0870		-0.0038

Source: Eurostat data processing, accessed 16.03.2019.

Analyzing the dynamics of the rapeseed sale price in Romania, we note that absolute base-based changes show an oscillating trend, with significant variations over the reference year. With regard to the dynamics of the rapeseed sale price, by reporting each year to the previous one, we note that the absolute values with the base chain register the most pronounced increase in 2015 compared to 2014 (increase over 22%). At the opposite is the price recorded in 2014 to 2013, representing a decrease of about 15%. Analyzing the absolute value of a percentage of the change rate, we can say that the 1%

increase in the sale price of rapeseed in any year compared to 2012 is equivalent to an absolute increase of 0.4104 euro/100 kg (Table 7).

CONCLUSIONS

More than 12 years after Romania's accession to the European Union, but also benefiting from two National Rural Development Programs (NRDP) worth 16.3 billion euros, rural space has changed and businesses in the field agriculture have developed. Part of the funding received from the European Union was used by Romanian farmers to build grain storage facilities, which helped farmers get a better price to capitalize on production. However, existing storage facilities are still insufficient to make the difference in the market. Still, the price of agricultural products is seasonal, as most agricultural producers sell their grain at the time of harvest. The high supply of agricultural products during the harvest period affects the sales price, as traders are the ones who decide on the market price.

At the same time, the subsidies, which most often make the difference between the profit and the loss for the Romanian farmers, play a very important role. This should also be taken into account in the future of the CAP (after 2020).

Without a Romanian stock market where the price of cereals and the disadvantage of the geographical location of Romania in the immediate vicinity of the most grain producers Ukraine and Russia, our country can not influence the price of cereals. Also, the absence of road infrastructure determines the differentiation of the price received by farmers, depending on the positioning of their farms towards Constanta Port, as the largest quantity of grain is exported from the country through Constanta Port. [6]

Equally, the output obtained at national level is the one that determines the farm gate sales price. When weather conditions are favorable and large grain quantities are being obtained, the price falls substantially, as the supply is significant, instead, if the weather conditions are more difficult and the yields are small in quantity, then the sales price suffers a slight increase, as the supply of cereals in the market is limited.

REFERENCES

[1]Bălan, E., M., 2017, World trade in cereals, World Economy Review, Vol. 9 (1), 66-74.
[2]Dumitru, E.A., Micu, A. R., Alecu, I.N. *et. al*., 2017, Analysis of the Situation of Romanian Village - Case Study Grindu Commune, Ialomita County, Conference: 29th International-Business-Information-Management-Association Conference Location: Vienna, Austria, vol. I-VII, 740-747.
[3]Dumitru, E. A., Tudor, V. C., Micu, A. R. *et. al.*, 2017, Analysis Regarding The Direct Payments In The European Union, Scientific Papers-Series Management Economic Engineering In Agriculture And Rural Development Vol. 17 (4), 113-116.
[4]Gevorkyan A.V., 2019, Exchange market pressure and primary commodity - exporting emerging markets, Applied Economics, Vol. 51 (22), 2390-2412.
[5]Micu, M. M., Tudor, V., 2012, Distribution Of Farms And Utilized Agricultural Area Of Romania By The Size Classes According To Legal Personalities, Scientific Papers-Series Management Economic Engineering In Agriculture And Rural Development Vol. 12 (1), 127-132.
[6]Micu, A. R., Tudor, V., Dumitru, E. A., 2018, Researches On The Capacity Of Marketing Agricultural Crop Production In The South-West Oltenia Region, Scientific Papers-Series Management Economic Engineering In Agriculture And Rural Development Vol. 18 (4), 187-192.
[7]Popescu, A., 2018, Romania's Sunflower Seeds Production, Export And Import- Analysis Of The 2007-2017 Period And Forecast For 2018-2022 Horizon, Vol.18 (4), 261-269.
[8]Popescu A., 2018, Maize And Wheat - Top Agricultural Products Produced, Exported And Imported By Romania, Vol. 18 (3), 339-352.
[9]Roussy, C., Rider, A., Chai, K. *et al*., 2018, Marketing contracts and risk management for cereal producers, Agribusiness, Vol. 34 (3), 616-630.
[10]Tudor, V., Micu, M.M., Temocico, G., 2013, Mutations in Romanian Agriculture after De-Collectivization and Privatization, Conference: 20th International Economic Conference of Sibiu - Post Crisis Economy - Challenges and Opportunities (IECS) Location: Sibiu, Romania, Vol. 6, 424-429.
[11]Wolz, A., Moellers, J., Micu, M. M., 2018, Cooperation Among Individual Farmers In Romania: Constraints And Options, Scientific Papers-Series Management Economic Engineering In Agriculture And Rural Development Vol. 18 (2), 489-492.
[12]Zahiu, L., 2010, European Union agriculture under the impact of the Common Agricultural Policy, Publisher Ceres, 76-102.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE PRINCIPAL COMPONENT ANALYSIS AS RURAL DEVELOPMENT LEVEL ASSESSING METHOD IN THE REPUBLIC OF MOLDOVA IN THE CONTEXT OF REDUCING SOCIAL EXCLUSION

Alexandru GORGOS, Iurie DANILOV, Nina PUȚUNTEAN

State Agrarian University of Moldova, 44 Mircești Str., 2049, Chisinau, Republic of Moldova, Emails**:** gorgosalexandru1@gmail.com

Corresponding author: gorgosalexandru1@gmail.com

Abstract

The purpose of the paper is to define the principal component analysis method for assessing the rural development level in the Republic of Moldova. The results of mathematical processing of primary data obtained as a result of surveying 9 rural localities using the Date Envelopment Analysis are presented. Applying the rating method as a key indicator of sustainable development it provides a comprehensive approach to the rural area issues. Socio-economic and ecological characteristics of the evaluated sample are also evaluated.

Key words**:** *rural development, data envelopment analysis, sustainability, principal component analysis*

INTRODUCTION

The National Strategy for Sustainable Socio-Economic Development of the Rural Areas in the Republic of Moldova explicitly stipulates the need to maintain the macroeconomic balance. The implementation of adequate and coherent economic policies that will be in line with the agreed EU objectives, in particular the revised Lisbon Strategy ensures the achievement of sustainable economic growth as well as of the operational objectives of the Horizon 2020. It is clear that mathematical modeling of macroeconomic processes represents a necessity at the present stage of assessing Moldova's rural development level, which will allow the choice and particularly the adjustment of this strategy depending on the real regional situation.

The evaluation of sustainable socio-economic development level is based on the analysis of the rural environment of the Republic of Moldova (socio-demographic indicators, data on the living conditions in rural areas, income and consumption structure) using official statistical data. This analysis is required by the need to shift the agriculture from subsistence to efficiency, the introduction of the EU Community policy in the Republic of Moldova, as well as by the need to implement the information and communication technology as a prerequisite for sustainable rural development, which are represented by the flows (materials, information, knowledge transfer) established according to the macroeconomic benchmarks, so that it would be possible that starting from the current situation to achieve the expected objectives [2].

The study was focused on the following objectives:

-developing a new concept according to which the sustainable rural development in the Republic of Moldova, regarded as the ultimate objective of the modern society development, represents a Nash equilibrium between the three systems that interact, namely the economic, social and environmental system;

-developing a nonparametric model for assessing the level of socio-economic development of rural areas;

-defining the mechanisms and policies for attracting and absorbing the subsidies and grants for research-development-innovation, with a focus on attracting private sector funds as an alternative to the financing from the state budget [3].

The objectives proposed and the monitoring of their progress could be achieved using specific indicators of the two characteristics related to the strategic management approach.

The close link between the established objectives and the monitoring indicators allow for a new approach, such as the strategic management of the sustainable rural development in the Republic of Moldova, which is more appropriate than the rigid planning approach that has proved inefficient. Sustainable development indicators enable for long-term monitoring of progress towards achieving objectives, being an indispensable tool for agricultural policies that set the strategy and development level concomitantly informing the general public about the achievements, including the failures or compromises made during the dynamical evolution of sustainable socio-economic development process.

MATERIALS AND METHODS

In recent years, several studies have been conducted to assess the rural development level in the Republic of Moldova using the method of Data Envelopment Analysis (DEA) [8].

The level of rural development can be defined as the weighted sum of outputs to the weighted sum of inputs as follows:

$\theta_0\ (u, v) = \sum_r\ u_r\ y_{r0}\ /\ \sum_r\ v_i\ x_{i0}$

where:

θ_0: relative rural development level of the rural locality

u_r: output weight, r= 1, 2.

v_i: input weight, i= 1…6

$$\min \varepsilon\ \theta - \varepsilon \left(\sum_{i=1}^{2} s_i^- + \sum_{r=1}^{2} s_r^+ \right)$$

$$\sum_{j=1}^{6} x_{ij}\ \lambda_j + s_i^- = \theta\ x_{i0}$$

$$\sum_{j=1}^{6} y_{rj}\ \lambda_j - s_r^+ = y_{r0}$$

$$\lambda_j \geq 0,\ j\ = 1 \ldots 6$$

The main objective of this research was to identify and assess the level of rural development by including the three basic components – the economic, social and environmental one. The sample was created as a result of surveying 938 economic agents located in 9 districts of three different geographic regions. of the Republic of Moldova in 2016. The survey included information on the economic and social structure of localities and data on the ecological condition of the environment presenting both qualitative and quantitative data. The mathematical processing of primary data was carried out with the support of DEA_UASM software, developed within the Faculty of Economics of the State Agrarian University of Moldova.

RESULTS AND DISCUSSIONS

Establishing these goals and measuring their progress through nonparametric methods using some indicators represent two highly correlated characteristics specific to strategic approaches. Strategic management approaches and strategic processes have become more and more popular in the past two decades, both in the public and private sectors, once the rigid planning inefficiency has become obvious. The methodology used in this investigation represents the comparative analysis of the classic sequential model with a more recent model of economic, social or ecological efficiency, coming from a highly dynamic field - Information Technology - namely the cyclic model of convergence. Sustainable socio-economic development indicators of rural areas have proliferated since the Rio de Janeiro Summit in 1992. Thus, the Sustainable Development Strategy adopted by the European Council in Gothenburg in June 2001 explicitly stated its intention to regularly monitor the indicators of sustainable development in order to achieve the fundamental objective of „meeting the needs of present generations without diminishing the chances of future generations to meet their own needs" [7].

There are about 1,614 villages in the Republic of Moldova with a population of 2 million 42 thousand people per year, which is 57.5% or more than half of the country's population. In

recent years, there has been a gradual decline in the rural population number. Moldova faced a serious demographic crisis, which leads to the disappearance of about four villages per year, the equivalent of minus 10 thousand inhabitants. Types and characteristics of families as a percentage are presented in Figure 1.

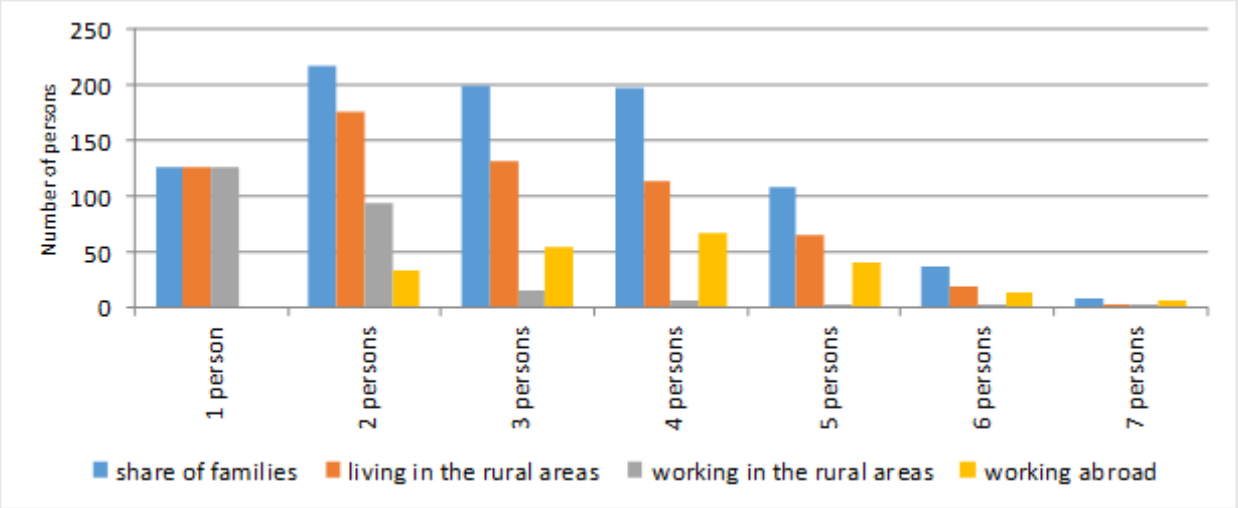


Fig. 1. Family composition, (persons)
Source: Own calculations based on data of the Survey

According to Figure 1, there is a change related to the concept of family size. If earlier a family with three or four children was a common occurrence, now its share does not reach even 10%. Most families consist of 2-3 persons.

Families with 2 family members are common and represent 24% of the total share of families. The share of such families reaches a critical maximum and is about 70%, while the share of families consisting of 7 persons reaches only 0.90%. One of the reasons that led to the decline of the birth rate is the financial situation in the family. Demographers state that every fifth family is faced with the problem of maintaining their own children. According to the authors, current amounts of government support are insufficient. Although the amount of lump-sum childbirth allowance has increased 10 times over the past 15 years, it is not sufficient to cover all necessary expenses [1].

The share of families consisting of 3 or more persons takes the decision to get a job not in the country, but abroad. Therefore, this share of families records the highest rate of migration: 3 persons - 26% and 4 persons - 32%. There weren't observed outflows of nationals to other countries in the share of families consisting of 1 person, who are retired. Namely these families record a high level of job security in rural areas, which is more than 50%.

Among the reasons determining Moldovan citizens to leave the country we could mention: higher wages in the host countries, higher standard of living, expanded opportunities for personal development and the presence of "successful" migrants and social networks created by them abroad (relatives, acquaintances and close friends). Thus, in 2007, the income transferred by Moldovan migrants from abroad reached its peak, constituting 36% of GDP.

The manager (household manager) is the person who takes important decisions concerning everyday activities. The manager of an agricultural enterprise can be an individual, a group of individuals or a legal entity on behalf of and by which the agricultural enterprise operates and which is responsible for the economic and legal activity of the agricultural enterprise protecting it from economic risks resulting from the activities carried out by the agricultural enterprise.

The analysis of the figure 2 shows that most household managers are retired or near retirement age. Thus, 29% of respondents are classified in the 51-60 age group, which makes up 29% of the total population interviewed. Almost the same number of interviewees fall into the age groups adjoining the above mentioned: 61-70 and 40-50 years old, each group representing about 23% of the statistical population. If we sum up the population of the last three age categories, which generally corresponds to the retirement population, this figure reaches about 63% of the total surveyed household managers.

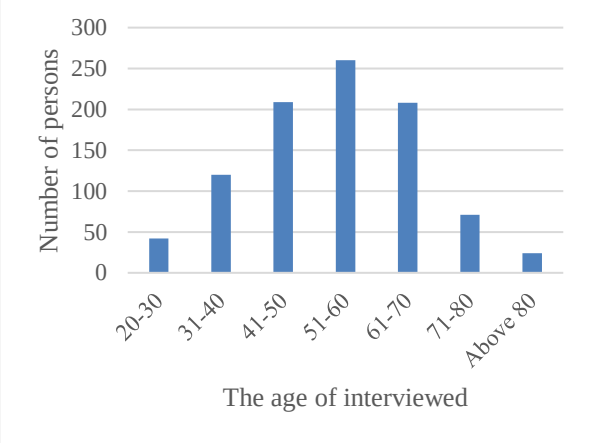


Fig. 2. The age of interviewed household managers from rural areas.
Source: Own calculations based on data of the Survey

The demographic situation in the rural areas continues to decline. There is a reduction in the population number accompanied by the population ageing and decreased life expectancy. In 2015, the population aged 60 years or over numbered 500.4 thousand people. It should be noted that the pace of Moldova's population ageing is much higher and accelerated than in developed European countries. The share of elderly people in the overall population structure has almost doubled in only 50 years. Based on the example given in Figure 2 one can observe the average age of the enterprise manager [5].
Most household managers are men.
As a rule, women as household managers fall into the older age category, as they are more longest-livings than men. Also, in some cases, women take the position of household manager if their husbands go to work abroad to support the family.

Table 1. Distribution of household leaders/managers by gender

N	Household manager by gender	Number	Percentage share, %
1	Man	668	75
2	Woman	224	25
	Total	892	100

Source: Own calculations based on data of the Survey.

For the Republic of Moldova, the presence of a large number of entrepreneurs aged between 41 and 70 years (75%), and a very low number of young entrepreneurs involved in agricultural production (5%) are typical. Thus, the opinion that the largest number of people who are trying to open their own business are young people has not been proven to be true, since the main group of entrepreneurs are people aged more than 30 years. This phenomenon points out to an intensive urbanization of a large part of the young population, as well as to a significant migration flow.
A large share of entrepreneurial activity falls into the age category from 30 to 50 years old - 36%, from 50 to 60 years old - 29% and over 60 years old - 34%. According to the Law on State Social Insurance Pensions, the retirement age in Moldova is 57 for women and 62 for men. That is, a significant share of family enterprises are headed by people of the pre-retirement and retirement age from 50 to 70 years (52%).
In 2015, the minimum payment amount for the old-age security pensions for agricultural workers was 844 MDL. As a result, less well-off rural people, namely pensioners, are involved in the management of farms. Farm activities can be easily combined with regular household work. At the same time, it allows to provide the family with fresh food products, as well as with an additional source of revenue.
It has been established that most family-owned enterprises are headed by men, the family-owned firms headed by women being 5 times fewer, and there is also a "mixed"

variant, when the managers are representatives of both sexes [4].

As it is presented in the Table 1 the number of farms headed by men is higher and makes up 75%, while the share of women involved in farm management constitutes 25%. But if we compare economically active people by sex, then there are no big differences. The share of women is 49.2%, while the share of men slightly exceeds 50.8%. Thus, women represent a significant share of the economically active population involved in the agricultural sector.

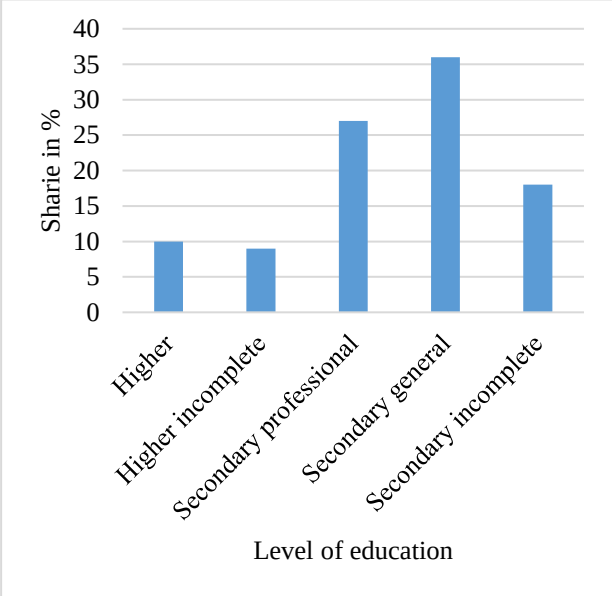


Fig. 3. Classification of household managers by the level of education
Source: Own calculations based on data of the Survey

Many rural women who are "statistically" classified as "economically inactive" may actually work as farmers for themselves or as unpaid family workers in small farms or in vegetable gardens, but they claim that they are not employed in the agricultural sector. Therefore, the share of women's involvement in farm management exceeds the figure obtained as a result of the accomplished surveying.

The qualification of population plays a decisive role in the socio-economic development of rural localities. In this context, the level of education is the determinant factor of employee qualification. Despite the expectations, the share of population with incomplete and general secondary education, i.e. without specialized professional training, exceeds half of the household managers, which affect the income level of families in rural areas.

Education level is the most important factor closely connected with the productive capacities of farms and the level of farms' income. All this ultimately affects the welfare of farms and overall economic growth across the country. The well-being of developed countries is based on a high education level of their population, as education represents an important tool for empowerment and capacity building. A number of empirical studies have shown that wages increase significantly as workers' degree of education rise. Based on the example of investigated farms, we can consider the level of education of managers Figure 3.

According to Figure 3, less than 20% of all farm owners have incomplete secondary education. As for the incomplete higher education, here the maximum gap is achieved being less than 9%, while for the higher education it is 10%. It is worth noting that 36% of all agricultural enterprise owners indicated that they have a secondary general education, which is the largest share. Also, a considerable share is occupied by the category with secondary professional education - 27%.

We believe that the education level of a manager reflects the quality of farm management, which leads to positive results.

Unlike the previous periods, the number, but also the share of rural population involved or employed in the agricultural sector decreased considerably as in Figure 4. Although the number of people employed in the non-agricultural sectors is relatively high, reaching 36%, their number does not even compensate for the loss of jobs in the agricultural sector. The number of unemployed people reported is 13%. If, however, we add those who have reported work in the household management, the number of unemployed could constitute about 45%, which is an alarming situation.

The non-agricultural sector includes all other activities carried out in rural areas, except for activities in agriculture, fishing and hunting. Non-agricultural activities include any non-

agricultural activities. It may include the work of farm family members in a city or in another country [6].

Figure 4 provides an overview of employment data of farm managers. The data show that 37% of managers receive income from rural activities, which is equivalent to non-agricultural employment. Part-time non-agricultural employment is the main source of employment and constitutes about 36%, which is 4% more than the employment rate presented in farm.

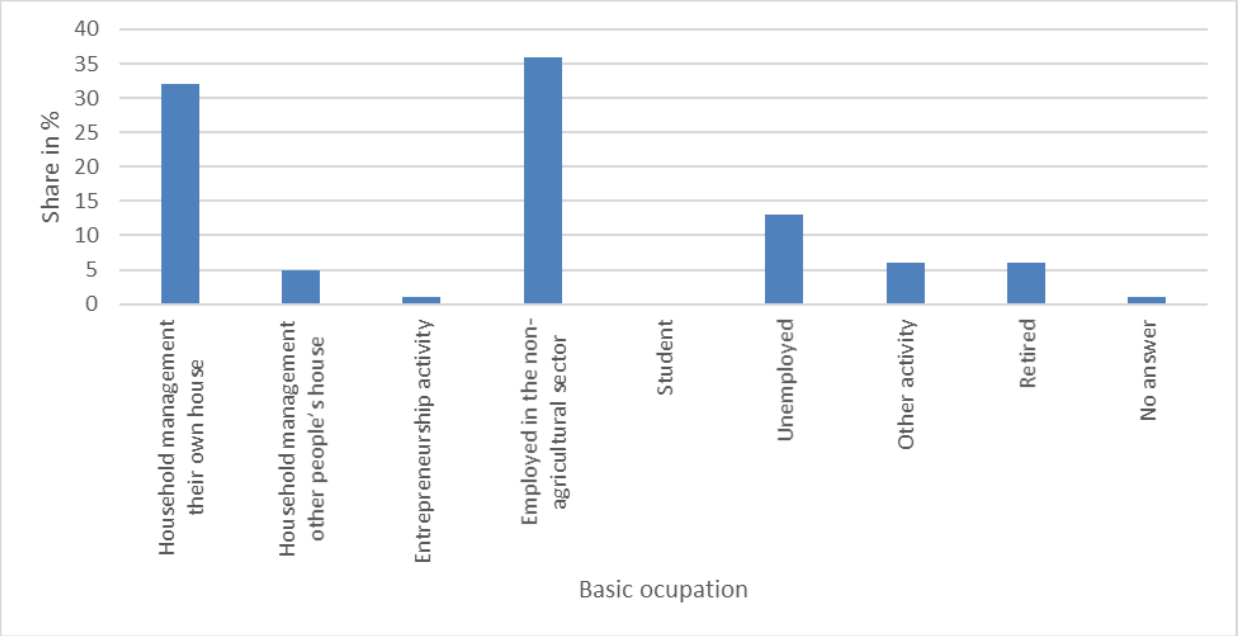


Fig. 4. Classification of household managers by their basic occupation
Source: Own calculations based on data of the Survey

Specialized literature highlights two groups of factors that influence the non-agricultural employment. These are demand-pull factors and distress-push factors:

-*Demand-pull factors* - describe what happens when there is a profitable opportunity for employment in the non-agricultural sector for those employed in agriculture;

-*Distress-push factors* - describes what happens when insufficient incomes in agriculture force you to look for another additional source of income in the non-agricultural sector.

In other words, the rural population switches to non-agricultural activities under the pressure of two types of factors: either the demand for the results of this activity leads to an increased income which is above the level of income from agriculture, or the population is looking for possible additional sources of revenue in scarcity conditions.

CONCLUSIONS

As a result of analyzing the primary information on the level of rural development in the Republic of Moldova, the following conclusions can be drawn in order to optimize the agricultural policy in this field:

-theoretical approach to assessing rural areas involves the development of appropriate mathematical models describing sustainable regional development based on the principle of economic, social and environmental balance;

-the techniques for assessing the level of rural area development based on linear programming require to define some rating of localities using the method of Data Envelopment Analysis (DEA).

This ranking represents an instrument that has proven to be very useful in assessing sustainable development when the parametric methods (econometric approaches) do not cope with the complexity of agricultural

problems. The criteria for evaluating optimal solutions in the sustainable development of the rural areas are based on the elasticity of the economic, social and environmental factors that determine the performance of the agricultural policies in this field.

REFERENCES

[1]Buhociu, F., Buhociu D., 2012, Structures for regional development to support rural development. In: Agrarian economy and rural development - realities and perspectives for Romania, Bucharest, 43-48.
[2]Buliga-Ștefănescu, A., Necula, R., 2018, The analysis of national programme for rural development measures and the evolution of agricultural holdings in the period 2007-2016 at the level of Olt county. In: Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. vol. 18, p. 67-74.
[3]Davidova, S., Cuddy, M., Bauer, K., 2006, Integrates development of agriculture and rural areas in central European countries. Lexington books, UK, p. 248.
[4]Green, W.H., 1993, The econometric approach to efficiency analysis, In: The measurement of productive efficiency, Oxford University Press, New Yourk, 68-119.
[5]Mursa, G., Paraschiv, R., 2009, Rural Development in Romania. Opportunities and difficulties. Lucrari Stiintifice Seria Zootehnie, Universitatea de Stiinte Agricole si Medicina Veterinara, Vol. 52, Iasi, 141–145.
[6]Ornella, M., Ramona, F., Ivo, G., 2012, The evaluation of rural competitiveness in creating a policy of rural development in Croatia. Journal of Food Agriculture & Environment. Vol 10(2):962-969.
[7]Rizov, M., Gavrilescu, D., Gow, H., Mathijs, E., Swinnen, J.F.M., 2001, Transition and Enterprise Restructuring: The Development of Individual Farming in Romania. World Development, 29(6):1257-1274.
[8]Spircu, L., Bădin, L., Ciumara, R., Mitrut, D., 2001, Efficiency and productivity. Techniques of measurement, software and economic applications. Bucharest, Economic Publishing House, p. 208.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ECONOMETRIC MODELING, EVALUATION AND FORECASTING OF THE RURAL WORKFORCE SITUATION IN THE REPUBLIC OF MOLDOVA

Svetlana GOROBIEVSCHI[1], Liubovi DOROFEEVA[2]

[1]Technical University of Moldova, 168 Bld. Stefan cel Mare, Chisinau, Republic of Moldova, Email:gsvetic@gmail.com
[2]Transnistrian University of Tiraspol, 25 October, 107 Avenue, Tiraspol, Republic of Moldova

Corresponding author: gsvetic@gmail.com

Abstract

A very actual problem for the Republic of Moldova represents the migration processes of rural population, expressed by workforce flows in this region. Along with the free circulation of the workforce to more prosperous countries, migration flows provoke economic imbalances in country development. In this paper, the authors have set the objective to determine the key factors that influence the migration level in the Republic of Moldova, especially that of the rural sector, through the prism of econometric methods. The typology of econometric methods used by economic sciences is extremely vast. The more and more often use of these models in economic phenomena investigation are due to significant progresses made in the field of estimation methods of models' parameters and that of verification tests, on which these are based on and, last but not least, that of the use of electronic calculators that allow the operative solving of the most complex economic problems. In conclusion, the authors propose a model of econometric regression between the selected variables that have a maximal level of influence on the rural migration situation in the Republic of Moldova, justified by elasticity coefficients values.

***Key words*:** *econometric model, rural migrants, rural sector, unemployment rate*

INTRODUCTION

Modeling represents the main instrument of econometric investigation of economic phenomena. Models are representations of systems that can be studied without them being physically, socially or economically touched. An econometric model represents a formal expression, inductive of an economic regularity – represents a way of knowing an economic object, at the same time an econometric model is a method that leads to obtaining new knowledge and information about the state, structure (connections between elements) and evolution of a process or economic system [1, 2, 5].

The generated model represents an intermediate link between theory and reality. It represents a way of confrontation between theory and practice, the only way of experimentation on which the economic science can ground its hypotheses, as the object of investigation can be only observed, but not isolated and studied in laboratory.

Econometrics represents the totality of methods and techniques of modeling and analysis of economic variables dynamics, and of connections between them. Econometrics uses o large part of statistical inference techniques offered by mathematical statistics.

When particularizing the econometric bonds with some of the economic disciplines, it's necessary to highlight the correspondence between econometric modeling and forecasting. Macro or microeconomic forecasting represents a domain that largely uses the results of simulation and those of econometric forecasting. The forecasting activity in economics "offers" a set of elements useful for model development, especially regarding its specification phase. At this stage, the forecasting defines endogenous (resulting) variables and the exogenous variables package corresponding to the established objectives depending on existent statistical information [3]. Econometrics, in turn, contributes to obtaining economic variants, offering information regarding

endogenous variables behavior in different alternatives of acting the economic levers.

Models identification consists in the chosen function or group of mathematical functions, which help to approximate the endogenous variable y values according to the exogenous variables variation x_i, i = 1, 2, …, n. The range of mathematical linear or nonlinear functions, that can be used in this regard, is large. The choice of one mathematical function, as a regression function of an econometric model, is made based on real or empiric values of economic phenomena, systematized, either in chronological series or space series.

A first appreciation on variables distribution x_i, i = 1, 2, …, n and y is made using the diagram of values spreading, actually a representation of points on an axis system with x_i and y coordinates. The visual analysis of organization and form of the obtained cloud of points offers important indices about the relation between variables. Statistical data will support the association hypothesis between variables if the form of the cloud of points is approaching to a functional curve identified with a specified precision. Thereby, the associations can be appreciated by linear, curvilinear and other analytical expressions. If in the points cloud can't be distinguished a tendency, then the variables are not related. By choosing the tendency of the curve that approximates the function in the best way possible, we can identify the equation (R2 – coefficient of determination – must be a value as close as possible to 1).

MATERIALS AND METHODS

The parameters of an econometric model are represented by the coefficients of the accepted regression function at its identification stage. These parameters are unknown and must be estimated on the basis of experimental data, systematized in statistical series of those two variables y and x, via their respective values y_i, x_i, i = 1, 2, …, n. The regression functions of an unifactorial model may be linear functions, or nonlinear functions expressed by a power function, exponential nonlinear function but that can be linearized through such procedures like: logarithm zing, switching variables and arbitrary fixation of a value of some parameters [7].

The selection process of the best regression takes place in the context in which exists a dependent variable y and a multitude x of possible independent variables. In order to select the best regression, some stages should be followed:

- identifying all possible independent variables (specifying the maximal model);
- specifying selection criterion of the best regression;
- specifying a strategy for independent variables selection;
- performing the model estimation and analysis;
- evaluating the chosen model of reliability;
- analyzing R2 values and retaining that subset of variables for which is fulfilled the accepted compromise between the number of variables and the size of the determination coefficient R2.

In this context, selection methods of independent variables are econometrically defined.

Prospective selection, that starts with including into the model the independent variable with the greatest correlation coefficient with the y variable. At each next step, every variable, which is not included into the model yet, should be analyzed with a sequential F test and the model is expanded by including that variable that gives a maximal contribution (critical probability in the F test is the lowest). The process stops when the model cannot be extended anymore, the usual criterion is that of fixating an entry verge (P_{in}) and accepting only those variables for which critical probability in sequential F test is lower or equal with this verge. This procedure has limits like the fact that certain variables won't be ever included in the model, so their importance won't be determined. On the other hand, an included variable at a certain step remains in the model forever, even if by a further including of other variables, its importance will decrease.

Retrogressive selection starts with estimating

the complete model after which, in a successive number of steps, the insignificant variables are removed from the model. At each step, on basis of a partial F test, the variable with the greatest critical probability is eliminated. The process stops when there isn't any variable that can be eliminated. The usual criterion is that of fixating an elimination verge (P_{out}) and taking into account just those variables that have the critical probability higher than that of this verge.

Step by step selection. It's a combination of those two previously described methods. At a subsequent step of the prospective regression, the elimination of a variable is allowed, like in the retrogressive selection. A variable eliminated from the model becomes a candidate for including into the model, while a variable included into the model becomes a candidate for excluding out of the model. For preventing the process to enter an infinite cycle, a condition should be fulfilled: $P_{in} \leq P_{out}$.

In order to identify the trend of some econometric indices that characterize rural workforce, the authors used SPSS and Maple packages and the official statistical database of Republic of Moldova for the identification of the respective econometric models, based on which one could make their forecasting in the nearest future.

These selected official statistical data are presented in Table 1.

Table 1. The average annual rate of rural unemployment based on Genders in the Republic of Moldova, 2010-2017

Rural sector	2010	2011	2012	2013	2014	2015	2016	2017
Both genders	5.0	5.4	5.2	3.9	4.1	2.7	3.5	2.6
Men	6.3	6.7	6.5	6.5	5.0	3.2	4.8	3.2
Women	3.6	4.1	3.9	2.8	3.0	2.2	2.2	1.9

Source: http://statbank.statistica.md/pxweb/sq/ba2142a6-e905-4ffe-b76c-f9384353a6e6, NBC

However, it is considered that, regardless of how suited for reality an econometric model would be, obtained estimations are probabilistic, and they cannot fully guarantee the true values that could be obtained, in case of being possible the exhaustive observation.

RESULTS AND DISCUSSIONS

Initial data were processed with standard statistical package SPSS and Maple in the period 2010-2017 [7, 8].

Thus, the average annual rate of rural unemployment based on both genders, noted as $y(t)_{R.s.r.a.s.}$ was identified as being described by the formula 1:

$$y(t)_{R.s.r.a.s.} = 7.1585 \cdot \exp(-0.0801 \cdot t) + 0.9713 \cdot t \cdot \exp(-0.0801 \cdot t)/(1+t^2) \quad (1)$$

Based on the formula (3.1) for the year 2017, with t = 8, we received $y(8)_{R.s.r.a.s.}$ = 3.8813, and for the year 2018, it will be equal to 3.5780. The graph of $y(t)_{R.s.r.a.s.}$ evolution is represented in Fig. 1.

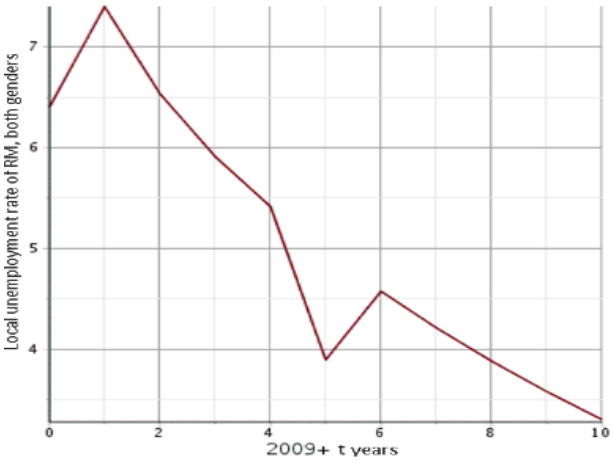


Fig. 1. The rate evolution of rural unemployment based on both genders in the R. Moldova, 2010-2017, %
Source: Own calculation based on data the of NBS.

Similarly, the annual average rate of men's unemployment rate, noted with $y(t)_{R.s.r.b.}$, was identified as being described by the formula 2:

$$y(t)_{R.s.r.b.} = 7.0053 \cdot \exp(-0.1016 \cdot t) + 0.01 \cdot t^2 \cdot \exp(-0.3047 \cdot t)/(1+0.01t^2) \quad (2)$$

Based on that formula (2) for the year 2017, with t = 8, we received $y(8)_{R.s.r.b.}$ = 3.2250, and for the year 2018, it was equal to 2.9070. The graph of $y(t)_{R.s.r.b.}$ for the period 2017-2018 is represented in Fig. 2 and confirms its decrease.

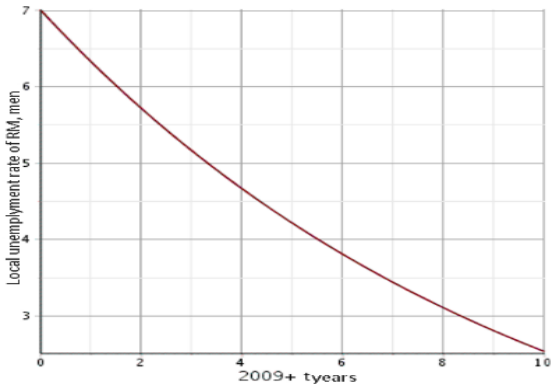


Fig. 2. The rate evolution of rural unemployment based on the male gender in the R. Moldova, 2010-2017, %
Source: Own calculation based on data of the NBS.

The annual average rate of women's unemployment rate, noted with $y(t)_{R.s.r.f.}$, was identified using the formula 3:

$$y(t)_{R.s.r.f.} = 4.1987 \cdot \exp(-0.1099 \cdot t) - \\ - t \cdot \exp(-0.0108 \cdot t)/(1+t^2). \quad (3)$$

Based on that formula (3) for the year 2018, with t = 8, we received $y(8)_{R.s.r.f.}$ = 1.8858, and for the year 2019, it will be equal to 1.6611. The graph of $y(t)_{R.s.r.b.}$ evolution is represented in Fig. 3.

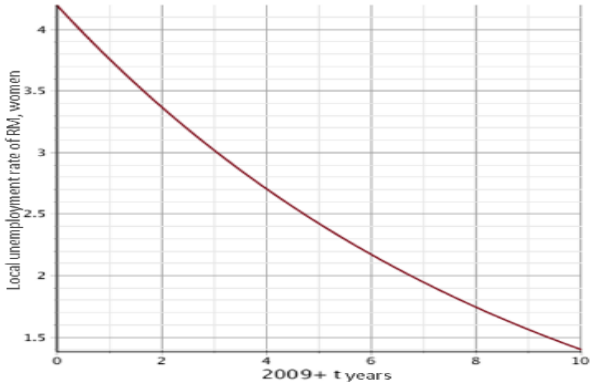


Fig. 3. The rate evolution of rural unemployment based on female gender in R. Moldova, 2010-2017, %
Source: Own calculation based on data of the NBS

In the same context, the authors identified the econometric models of rates evolution of rural unemployment depending on the sales incomes of the Small and Medium-sized Enterprises (SMEs) sector of the Republic of Moldova, in billion MDL, represented in the Table 2.

Table 3. The population consisting of 15 years old and more, working or in search of work abroad (Age, Gender and Average), 2010-2017 (thousand people)

Population by Gender	2010			2011			2012			2013		
	Average in republic			Average in republic			Average in republic			Average in republic		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Both Genders	69,9	12,2	57,7	69,7	12,3	57,3	71,2	15,1	56,1	72,1	11,9	60,2
Men	51,1	8,9	42,4	51,8	10,9	40,9	51,8	10,9	40,9	53,8	8,9	45,0
Women	18,8	3,3	15,5	19,5	4,2	15,2	19,5	4,2	15,2	18,3	3,0	15,2

Population by Gender	2014			2015			2016			2017		
	Average in republic			Average in republic			Average in republic			Average in republic		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Both Genders	69,1	11,0	58,2	72,3	11,0	58,2	60,6	12,2	48,4	58,1	10,2	42,9
Men	50,1	7,3	42,9	54,4	7,6	46,8	44,8	8,2	36,6	43,6	7,7	35,9
Women	19,0	3,7	15,3	17,9	3,1	14,8	15,8	4,0	11,8	14,5	2,5	12,0

Source: Own calculations based on data of the NBS,http://statbank.statistica.md/pxweb/sq/ba2142a6-e905-4ffe-b76c-f9384353a6e6.

Regarding the impact on labor markets of origin countries, the specialized literature highlights negative effects through modifications of workforce size and structure, depending on educational level and some positive effects through the reduced pressure generated by high unemployment rate that means low workforce occupation.

In order to highlight these effects in case of the panel of origin countries, in developed models were used endogenous variables: unemployment rate (total and by educational

levels), employment rate, workforce (total and by educational levels), participation rate of men and women on labor markets, work conditions expressed through a variable regarding the medium number of weekly worked hours (total, men, women).

From the statistical data presented in Table 3 using the program package were identified the following econometric models that express the trend of medium number of migrants from the rural sector of the Rep. of Moldova within the range 2010 + t, t = 0, 1, ..., 10.

Thus, the evolution of the average number of migrants of both genders from the rural sector of Republic of Moldova, noted as $y_{N.m.a.s.}$, was identified as being described by the formula 7:

$$y(t)_{N.m.a.s.} = 61.4203 \cdot \exp(-0.0338 \cdot t) + t \cdot \exp(-0.0108 \cdot t)/(1+t^2) \quad (7)$$

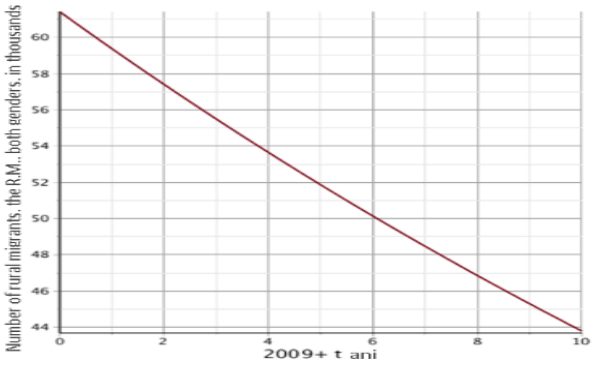


Fig. 7. The number of rural migrants – both genders, from the Republic of Moldova, 2010-2017, thousand people
Source: Own calculation based on data of the NBS.

Based on the formula (7) for the year 2017, with t = 8 we obtained = 46.9811, and for the year 2018 it will be equal to 45.4102. The evolution graph is represented in Fig. 7.

The evolution of the average number men-migrants from the rural sector of the Republic of Moldova, noted as $y(t)_{N.m.b.}$, was identified as being described by the formula 8:

$$y(t)_{N.m.b.} = 43.6859 \cdot \exp(-0.0162 \cdot t) - t \cdot \exp(-0.0108 \cdot t)/(1+t^2) \quad (8)$$

Based on that formula (8), for the year 2018, with t = 8, we obtained $y(8)_{N.m.b.}$ = 38.2628, and for the year 2019 it will be equal to 37.6594. The evolution graph of $y(t)_{N.m.b.}$ is represented in Fig. 8.

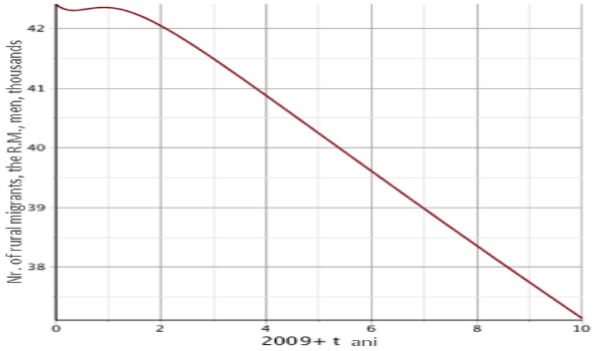


Fig. 8. Number of rural migrants – men, Republic of Moldova, 2010-2017, thousand people.
Source: Own calculation based on data of the NBS.

The evolution of the average number of women-migrants from the rural sector of the Republic of Moldova, noted as $y(t)_{N.m.f.}$, was identified as being described by the formula 9:

$$y(t)_{N.m.f.} = 16.2889 \cdot \exp(-0.0373 \cdot t) - t \cdot \exp(-0.0108 \cdot t)/(1+t^2) \quad (9)$$

Based on that formula (3.9), for the year 2018, with t = 8, we obtained $y(8)_{N.m.f.}$ = 11.9735, and for the year 2019 it will be equal to 11.5443. The evolution graph of $y(t)_{N.m.f.}$ is represented in Fig. 9.

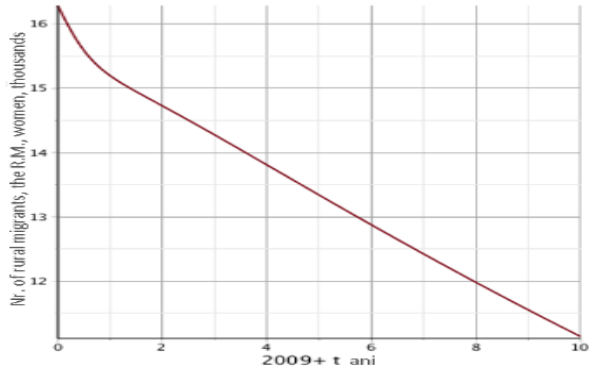


Fig. 9. Number of rural migrants – women, Republic of Moldova, 2010-2017, thousand people.
Source: Own calculation based on data of the NBS.

In the same context, the authors identified the econometric models of evolution of the average number of migrants– men and women from rural sector of the Republic of Moldova depending on the unemployment rate.

Thus, the econometric model of evolution of migrants medium number (both genders) from rural sector of the Republic of Moldova depending on unemployment rate $y_{R.a.s.}$, noted $z_{N.m.a.s.}(y_{R.a.s.})$, was identified using the formula 10:

$$z_{N.m.a.s.}(y_{R.a.s.}) = 34.7195 \cdot \exp(0.1043 \cdot y_{R.a.s.}) - 8y_{R.a.s.} \cdot \exp(-0.0108 \cdot y_{R.a.s.})/(1+y_{R.a.s.}^2) \quad (10)$$

Based on that formula (10) for rate $y_{R.a.s.}$ = 2.6 % for the year 2017, we obtained $z_{N.m.a.s.}(2.6)$ = 42.9340 thousand people, that is in concordance with the official statistical data presented in Table 1, therefore, for this year, the number of migrants (both genders) in rural sector was $z_{N.m.a.s.}^{official}(6)$ = 42.9 thousand people. According to this model, in the year 2018, $y_{R.a.s.}$ = 3.8813 %, the number of migrants will be equal to 50.1933 thousand people. The evolution graph of $z_{N.m.a.s.}(y_{R.a.s.})$ is represented in Fig. 10.

Fig. 10. Number of rural migrants – both genders and rural unemployment rate in the Republic of Moldova, 2010-2017
Source: Own calculation based on data of the NBS

Following the same approach, the econometric model of evolution of the average number of men-migrants from the rural sector of the Republic of Moldova, depending on the respective unemployment rate $y_{R.b.}$, noted as $z_{N.m.b.}(y_{R.b.})$, was identified as being described by the formula 11:

$$z_{N.m.b.}(y_{R.b.}) = 39.6785 \cdot \exp(0.0193 \cdot y_{R.b.}) - 20y_{R.b.} \cdot \exp(-0.0125 \cdot y_{R.b.})/(1+y_{R.b.}^2) \quad (11)$$

Based on that formula (11) for the rate $y_{R.b.}$ = 3.2 % of the year 2017, we obtained $z_{N.m.b.}(3.2)$ = 36,7356 thousand people, that is in concordance with official statistical data presented in Table 1, which for this year the number of migrants (men) in rural sector was $z_{N.m.a.s.}^{official}(3.2)$ = 35.9 thousand people. The evolution graph of $z_{N.m.b.}(y_{R.b.})$ is represented in Fig. 11.

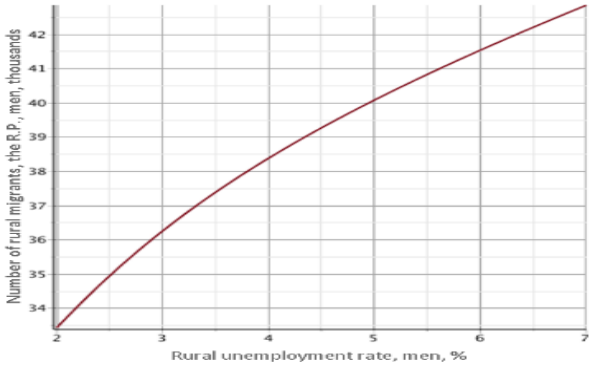


Fig. 11. Number of rural migrants – men and rural unemployment rate in the Republic of Moldova, 2010-2017
Source: Own calculation based on data of the NBS

The econometric model of evolution of the average number of women-migrants from the rural sector of the Republic of Moldova depending on unemployment rate $y_{R.f.}$, noted $z_{N.m.f.}(y_{R.f.})$, was identified using the formula 12:

$$z_{N.m.f.}(y_{R.f.}) = 9.7090 \cdot \exp(0.1258 \cdot y_{R.f.}) - 2.5y_{R.f.} \cdot \exp(-0.0013 \cdot y_{R.f.})/(1+y_{R.a.s.}^2) \quad (12)$$

Based on that formula (12) for rate $y_{R.f.}$ = 2.2 % for the year 2017, we obtained $z_{N.m.f.}(2.2)$ = 11.8663 thousand people, that is in concordance with the official statistical data presented in Table 1, which for this year, the number of migrants (women) in rural sector was $z_{N.m.f.}^{official}(2.2)$ = 11.8 thousand people.
According to this model, in the year 2018 $y_{R.f.}$ = 1.90 %, this number of migrants will be equal to 11.3032 thousand people. The evolution graph of $z_{N.m.f.}(y_{R.f.})$ is represented in Fig. 12.
It is difficult to observe the migration based on the official statistical sources because national legislation doesn't stipulate citizens' obligation to announce the authorities in case

of leaving the country. For migration, the existent data from administrative sources don't cover the entire phenomenon of migration existing a severe under-evaluation of migrants' number. The lack of information regarding the exact number of migrants leads to the necessity of a new statistical thinking, based on fuzzy estimating methods, which will allow the national institutes of statistics to use, within the procedure of statistical data processing, some "well documented methods of statistical estimation, based on advanced scientific methods".

Fig. 12. Number of rural migrants – women and rural unemployment rate in the Republic of Moldova, 2010-2017

Source: Own calculation based on data of the NBS.

The data sources used for estimating the dynamic of migrants' stock are the following:

- an econometric model based on estimation techniques by small domains, that ensures the determination of migrants' stock in rural sector (at the national level);
- migrants' flows determined by the national office of statistics, which ensures the structure based on age and genders of migrants' stock.

The official statistical data were used regarding available flows of migrants from the rural sector in the period 2010-2017.

The estimation method of migrants' stock consists in the application of some econometric models of estimation by small domains. It involves the production of some estimations for which the range of selective statistical research includes a small number of statistical units, or – in some cases – these don't exist. The conceptualization of the expression „estimation by small domains" is a little confusing, because this technique refers to domains that support detail/division levels, for which the number of selected statistical units is reduced. The estimation by small domains „borrows" relevance and accuracy by combining the obtained data from selective researches, with complementary information from other data sources (statistical or exhaustive administrative sources).

In order to ensure the representativeness by small domains, the estimators must have the property to not be moved (the estimated medium of the variable of interest has to represent all statistical units from the entire collectivity).

Taking into account the mentioned above and for the purpose of describing more clearly the migration process from the rural sector of the Republic of Moldova, the authors identified some econometric models of the logarithm of the respective number of migrants $\ln(Y_s^t)$, s ∈ {both genders, men, women}expressed as a multifactorial linear regression model in logarithmic form within a panel on the range of years 2010 + t, that has the following form:

$$\ln(Y_s^t) = \beta_{0,s}^t + \sum_{i=1}^{2}(\beta_{i,s}^t \cdot \ln(X_{i,s}^t)) + \sum_{i=3}^{5}(\beta_{i,s}^t \cdot \ln(X_{i,s}^t)) \quad (13)$$

In which were included as regresses the following independent variables (each of them expressed in logarithm form and interpreted as migration elasticity):

- $X_{1,s}^t$ – employment rate of the rural population in the Republic of Moldova, %;
- $X_{2,s}^t$ – unemployment rate of the rural population in the Republic of Moldova, %;
- $X_{3,s}^t$ – the share of SMEs sector in total per country, %;
- $X_{4,s}^t$ – sales incomes of SMEs sector, million MDL;
- $X_{5,s}^t$ – the average salary per country, MDL.

Table 4 presents the elasticity coefficients of the independent variables influence, specified in relation (13), on the evolution of migrants' number of both genders of the rural sector of the Republic of Moldova, identified on the basis of processing using the SPSS software package of the respective statistical data.

Table 4. the elasticity coefficients of the independent variables influence, specified in relation (13), on the evolution of migrants' number of both genders of the rural sector of the Republic of Moldova

Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	30.111	12.905		2.333
	ocup_rate_of_work_field_ln	-1.513	.773	-.704	-1.958
	unempl_rate_ln	-.173	.168	-.867	-1.030
	smes_per_country_ln	-4.156	3.188	-.291	-1.303
	sales_incomes_ln	.079	.292	.482	.270
	gross_average_salary_ln	-.041	.473	-.196	-.087

Source: Own calculation based on data of the NBS.

The econometric model in [13] form for s = both genders (bg), identified on the base of these elasticity coefficient has the following ratio:

$$\ln(Y_{bg}^{t}) = 30.111 - 1.513\cdot\ln(X_{1,bg}^{t}) - 0.173\cdot\ln(X_{2,bg}^{t}) - 4.156\cdot\ln(X_{3,bg}^{t}) + 0.079\cdot\ln(X_{4,bg}^{t}) - 0.41\cdot\ln(X_{5,bg}^{t}) \quad (14)$$

The main hypotheses formulated for simple regression models are based on general hypotheses of regression models (13), being expressed as:

-correct defining (specifying) of the model;

-data series are not affected by the measure errors;

-residual error are random variables of specified medium. The property reflects the fact that the other unregistered factors, with the exception of the exogenous characteristic, don't have a systematic influence on the medium of endogenous characteristic;

-residual variable is constant over time. This hypothesis is restrictive within the developed model, because the statistical data are published officially;

-residual variables are not auto-related.

By hypotheses validation is ensured a high degree of precision for developed models and, implicitly, the parameters' robustness, estimated through those two main methods (the method of least squares and the maximum fidelity method), used in case of models with random effects (RE) and those with fixed effects (FE). The testing of statistical meaning of model coefficients and validation of formulated hypotheses for its substantiation, were achieved by:

-differentiation of results and estimated coefficients via those two categories of models with random and fixed effects performed with the help of *Hasuman* Test;

-validation of hypothesis of relations absence at residual variables level, undertook through *Wooldridge – Lagram Multiplier* Test;

-homoscedasticity hypothesis was validated on base of *Breech – Pagan Lagrangian Multiplier* Test for models with random effects, respectively of modified *Wald* Test for group homoscedasticity for models with fixed effects;

-multicollinearity absence hypothesis validated through the *Correlation matrix of exogenous variables*, as well as through performing auxiliary regressions, while the individual and common influence validation of explanatory variables over the endogenous one is performed through *Fisher* and *t-statistical* Test, as well as through variation analysis (ANOVA).

The model and associated data were processed with the help of SPSS econometric package (Figure 13), using variables with respective statistical data and a time variable - *dummy* (1...7) – over the period 2010-2017.

The main objective of used regression analysis is the best possible explanation of dependent variable variation (a specific index of emigration process) through explanatory variables used within associated models.

The results of developed models processing based on migrant's flow logarithm (men, women and both genders) from the rural sector of the Republic of Moldova for the main countries of destination from the EU and Russian Federation show, in general, the same tendencies.

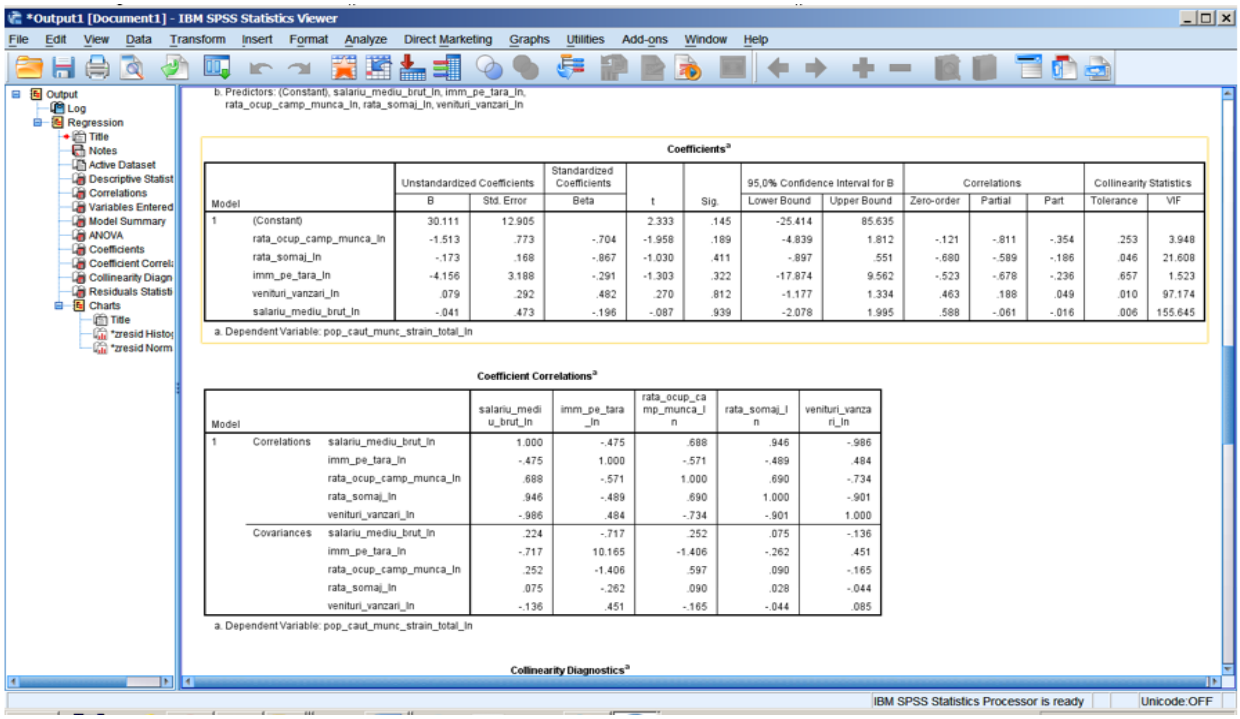


Fig. 13. The graphic interface of the SPSS
Source: Own calculation based on data of the NBS.

These aspects being also underlined by the flows' trend of men and women migrants at panel level, in the reference period of 2010-2017. The relative positive impact of migration on the labor market level, manifested through a light growth of employment rate and a decline of unemployment rate, is countered by the significant negative effects on the workforce size and structure, respectively, on the participation degree in the labour market depending on gender.

CONCLUSIONS

The small business development in rural environment represents a priority way of adjusting the labor market, which contributes directly to creating new work places in rural areas.

Nowadays, less than a third of the total small business enterprises activates in the rural areas. Sociologic researches highlighted the bureaucratic obstacles and financial means insufficiency as facts preventing the development of the small business in the rural areas.

1. Another priority way of adjusting the labour market in rural environment is the economic and social infrastructure development. This paper analyzes the grave situation in the field of transport and roads infrastructure, rural tourism, providing rural population with drinking water, canalization, natural gases, as well as the insufficient development of social infrastructure.

The development of public-private partnership in rural environment represents a high priority in adjusting the labour market and creating new work places in rural settlements. This paper analyzes the forms, conditions of creating and models of functioning of the public-private partnership in different countries and the possibility to apply them in the rural environment of the Republic of Moldova.

The work reward and motivation system is also a priority way of adjusting the labour market. The authors analyzed unfavorable situation in the rewarding of rural employees work in the Republic of Moldova and the insufficient degree of employees' motivation in the work activity and are formulated some proposals of improvement for the situation in this sector.

For the R. Moldova, the migration of a part of the total rural workforce has large (positive and negative) consequences, because it

modifies the number and the structure of the workforce, influences the consumption and investments in the country economy, as well as the behavior of the rural households on the labor market.

The research results underline the negative impact of migration on the size of workforce in the Republic of Moldova analyzed in the panel, but attenuated by the relaxation of pressures generated by the persistence of the high degree of unemployment. Thus, the process intensification of the workforce migration determines the decline of the unemployment rate for people with primary and secondary education. This can be due to additional investments in education performed by people who remained to improve the employment perspectives, as well as losing a part of this workforce category through migration, this people being ready to accept work places that were refused by the natives of host countries because of salary differences.

Regarding the positive effects induced by the relaxation of pressures generated by the persistence of unemployment high degree are countered by the negative impact on the workforce size, especially on that highly qualified (with tertiary education).

The main limitation of the performed research is reflected by the lack of objective data regarding rural workforce unofficial migration. Also, the performed research allowed the identification of new future opportunities and directions of research, by extending the analysis of determinant factors and moderators of rural workforce migration, as well as evaluating the economic consequences of this process.

REFERENCES

[1]Brücker, H., Hauptmann, A., Jahn, E. J., Upward, R., 2014, Migration and imperfect labor markets: Theory and cross-country evidence from denmark, germany and the uk. In: European Economic Review, 66, 205–225.

[2]Card, D., Dustmann, C., Preston, I., 2012, Immigration, wages, and compositional amenities. In: Journal of the European Economic Association, 10(1): 78–119.

[3]Chen, H.-J., 2008, The endogenous probability of migration and economic growth. In: Economic Modelling, no. 25, 1111-1115.

[4]Garçon, M., Omrane, A., 2011, Effets d'anticipation de problèmes de flux migratoires avec probabilité de migration endogène. 48ème Colloque ASRDLF Migration et Territoires. p. 1-10.

[5]Georgescu, V., 1998, New estimation methods in fuzzy regression analysis, based on projection theorem and decoupling principle", Fuzzy Economic Review, No.1, Vol III., 21-38.

[6]Gorobievschi, S., Bătrînescu, V., 2017, Problemele pieței muncii din mediul rural al Republicii Moldovași dioreciile soluționare ale acestora. În: Dezvoltarea economic-socială durabilă a Euroregiunilor și a Zonelor transfrontaliere. Vol, XXX., Coord.: Păduraru, T., Jilie, D.-T., Doncean, M., Tacu, G., Performantica; Institutul de Cercetări Economice și Sociale „Gh. Zane", Iasi, 2017, 220-228.

[7]IBM SPSS Statistics 20 Installation Instructions, http://www.spss.com.hk/info/files/Supplementary%20IBM%20SPSS%20Statistics%2020%20Installation%20Instructions.pdf, Accessed on September 2016.

[8]Maple2015.0WindowsX64. https://www.maplesoft.com/products/Maple/academic/, Accessed on September 2016.

[9]Ortega, F., Peri, G., 2013, The effect of income and immigration policies on international migration. Migration Studies, 1(1):47–74.

[10]Okkerse, L., 2008, How To Measure Labor Market Effects of Immigration: A Review. In: Journal of Economic Surveys, Vol. 22 (1):1-30.

[11]Pehoiu, G., Costache, A., 2010, The Dynamics of Population Emigration from Romania - Contemporary and Future Trends. In: World Academy of Science, Engineering and Technology 42, 594-599.

[12]Roman, M., Voicu, C., 2010, Câteva efecte socio-economice ale migraţiei forţei de muncă asupra ţărilor de emigraţie. Cazul României. Economie teoretică şi aplicată, XVII (7):50-65.

[13]Stratan, A., Savelieva, G., Cotelnic, G., 2012, Impactul migraţiei forţei de muncă asupra Republicii Moldova: aspecte demografice şi economice. În: Akademos, nr. 2(25):82 -90.

[14]Vidal, J.-P., 1998, The effect of emigration on human capital formation. In: Journal of Population Economics, 11, 589-600.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

SAFETY OF FEEDING BIOLOGICALLY WATERMELON VINE TO LACTATING GOATS AND ITS EFFECT ON THEIR PERFORMANCE, MILK YIELD AND PESTICIDE RESIDUE

Ayman A. HASSAN[1], Amal M. A. FAYED[1], Mohamed S. KHALEL[1], Afaf H. ZEDAN[1], Dorina MOCUTA[2]

[1]Animal Production Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: aymanan19@hotmail.com
[2]University of Agronomic Sciences and Veterinary Medicine Bucharest, Faculty of Management, Economic Engineering in Agriculture and Rural Development, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Email:dorinamocuta@yahoo.com

Corresponding author: aymanan19@hotmail.com

Abstract

This study was investigate the effect of untreated or biological treated with fungus (Trichoderma reesie) watermelon vine as a replace of berseem hay in ration of lactating goats on their performance and rumen fermentation. Twenty-five lactating goats 2-4 years old were assigned randomly to five groups (five goats in each) using a randomized complete block design. Animals fed ration contained BH plus CFM (1:1) and served as control R1, while groups R2, R3, R4 and R5 fed two levels of sun-dry watermelon vine (WMVH) or biological treated watermelon vine with fungus Trichoderma reesie (WMVF) (25 and 50 %), respectively by replacing BH in the ration. Results showed the goats fed R1 and R4 had significant (P<0.05) improved have been observed in milk production milk fat, protein yield, fat corrected milk (FCM) and feed conversion compared with R2, R3 and R5. The animals fed R1 and R4 were significantly (P<0.05) higher in NH_3-N, TVFA's concentrations and propionate than compared the other experimental ration. The animals fed R1, R4 and R5 had significantly (P<0.05) lower values for CO_2 and CH_4 than R2 and R3. So, it could be recommended that safety introduced of watermelon vine after treating it with fungus in diets without any adverse effect on their performance.

Key words**:** *watermelon vine, berseem hay, milk yield, pesticides, biological treatment and lactating goats*

INTRODUCTION

The feeding of agricultural products previously sprayed with pesticides to dairy animals is a common practice in most intensive farming systems. This is due to diversification of agricultural practices in an attempt to increase food production for the growing human population which leaves limited land for grazing animals. Such animals are therefore supplemented with crop remains after harvest (Njiru, 1996) [29].
Vegetables and dairy milk are important commodities in Egypt. However, agrochemicals are used intensively and excessively in the production system. Therefore, pesticides residues and contamination commonly occur in agricultural products and environments. Million tons of pesticides were annually applied in modern agriculture in order to increase productively through controlling insects, fungi, bacteria, viruses as well as grasses grown in between the economical crops (Liu and Xiong, 2001) [21]. However, less than 5% of these products are estimated to reach the target organisms. One of the most important problems with the use of pesticides is their possible persistence in the environment and, therefore, its possible incorporation into the food chain whereas it affects ecosystem and all human beings (Liu and Xiong, 2001) [21]. Major problem are caused from the contamination of food by pesticide, and pollution of environmental ecosystems. Presently, indoor use of pesticides for pest control is widespread in Egypt. No accurate information of the types and amounts of Egyptian household pesticide use, or numbers of contamination incidents is available. Generally, use of indoor pesticides

is inadequately managed. The results of a survey of Egyptian farmer's attitudes toward pesticides and their usage behavior garnered new insights as to how pesticides should be better controlled and regulated in Egypt (Mansour, 2008) [23]. The of pesticides has been known to have environmental impacts though its residues and contamination agricultural water and sediments are suspected as the source of pesticides contamination in agriculture and animal products (Ntow, 2003) [31].

Organochlorines (OCs) are known as persistent accumulated compounds in the environment since they are–degradable (Matsumura, 1985) [24], which eventually becomes a common residue detected in food crops such as corn, cabbage, rice, tomatoes, watermelon and soybean (Soejitno, 2002) [43]. Animal products such as eggs, meat and milk have also been reported to contain pesticide residues in Egypt (Ibrahim *et al*., 1994) [18]. In Egypt, extensive use of agrochemicals has led to public health and environmental problem (Yassin *et al*., 2002) [49].

The reactions that destroy pesticides change most pesticides residues in the environment to inactive, less toxic and harmless compounds. However, degradation is detrimental when a pesticide is destroyed before the target pest has been controlled. There are types of pesticide degradation, microbial, chemical, and photo degradation. Microbial degradation is the breakdown of pesticides by fungi, bacteria, and other microorganisms that use pesticides as a food source (DebMandal *et al*., 2008) [10].

Biological treatments using some fungi (Khorshed, 2000) [19] were tested to improve the nutritive value and digestibility of poor quality roughages. El-Ashry *et al.* (2003) [12] showed that enzymatic hydrolysis by fungi and biological conversion of cellulosic materials improves the nutritive value of residues especially crude protein and crude fiber. Biological treatment with fungi (*Trichoderma resei*) is reported to be highly effective in reducing the level of pesticides. Hassan *et al.* (2010) [17] showed that biological treatment with fungi or bacteria could be advisable in order to overcome the harmful effect of tomato haulms exposure to pesticide.

Watermelon vine hay (WMVH) had higher nutritive value, dry matter and protein degradability, as well as, it was better utilized than both wheat straw and rice straw by ruminants (Bassioumi, 2001) [4]. There are a few literatures on using watermelon vines in feeding ruminants; thereby we are in need for more studies on using these byproducts in feeding farm animals. This study was carried out to evaluated:

1-The use of Biological treatment with fungi (*Trichoderma resei*) and sun-dry treatment as detoxification of pesticides residues tools from watermelon vines

2-The effect of partial replacing (25% or 50%) of beseem hay by sun-dry or biological treated water melon vine with fungi in ration of lactating goats on their performance, milk production, milk composition, rumen and blood parameters during early lactation period.

MATERIALS AND METHODS

The present study carried out at Noubria Experimental Station, Animal Production Research Institute, Agriculture Research Center, Egypt. This study conducted to investigate the effect of partial replacement of berseem hay by the untreated and biological treated watermelon vines hay (WMVH) with fungi (*Trichoderma resei*) as detoxification of pesticides residues from on performance of lactating goats.

Experimental design, animals and diets

Twenty-five lactating goats of 2-4 years old and 30.58 ±1.23 kg weight in average and in the first week of lactation assigned randomly into five groups, each of five lactating goats were used for the present investigation. Animals fed berseem hay (BH) plus concentrate feed mixture (CFM) at the ratio 1:1 on DM basis (control) (R1) and two levels of replacement with untreated and treated WMV with fungi on the expense of BH (25% and 50%). The watermelon vine was collected from Noubria area, after harvesting, chopped

(1 to 3 cm in length) and left to sundry for a period of 7-10 days reaching a moisture content of 10-12%.

Concentrate feed mixture fed as an energy supplement during the experiment. It was offered twice a day at approximately 7:00 am and 02:.00 pm, while BH and WMV offered at 9:00 am and 4:00 pm. The feed allowances calculated according to NRC (2001) [30]. Goats had unlimited access to water. Experiment started from the last month from pregnant until the second month of postpartum. The CFM used in this experiment consisted of (%) 20 Yellow corn,19 Soybean meal, 26 Wheat bran, 25 Barely, 6 Molasses,2 Limestone, 1.5 Salt and 0.5Mineral premix. The chemical compositions of CFM, bersrrm hay (BH), untreated watermelon vine (WMVH) and treated watermelon vine with fungi (WMVF).

Table 1. Chemical analysis and cell wall constituents of Berseem hay (BH), untreated and treated watermelon vine hay with fungi (% of DM basis)

Item	CFM	BH	WMVH	WMVF
DM	89.36	88.12	87.86	86.51
OM	93.46	92.67	91.45	89.08
CP	15.75	12.76	8.63	14.57
CF	6.68	24.81	28.62	24.66
EE	2.96	1.62	1.36	1.02
NFE	68.07	53.48	52.84	48.83
Ash	6.54	7.33	8.55	10.92
NDF	36.85	56.26	63.39	59.57
ADF	19.55	37.82	47.86	45.06
ADL	3.57	8.16	11.87	9.98
Hemi-cellulose	17.30	18.44	15.53	14.51
Cellulose	15.98	29.66	35.99	35.08

Source:CFM: Concentrate feed mixture; BH: Berseem hay; WMVH: Watermelon vine hay (untreated water melon vine); WMVF: Watermelon vine treated with fungi

Does weighed directly 15hr after kidding then weighed at 15, 30, 45 and 60 days of age where kids weaned at 60 days old. The does milked at 15, 30, 45 and 60 days from kidding and samples of sucked milk were taken and analyzed for total solids (TS), solid not fat (SNF), fat, protein, ash %, lactose calculated by difference.

Rumen liquor:

Rumen liquor samples were taken from three animals of each group at the last day of milking using stomach tube at 0, 3 and 6hr after the morning meal. The rumen contents were collected before the morning feeding of the animals. Collected rumen liquor directly tested for pH using Orian 680 digital pH meter. Samples were strained through four layers of chesses cloth for each sampling time, while ammonia nitrogen (NH_3-N) was determined using magnesium oxide (MgO) as described by AOAC (2000) [3].Total volatile fatty acid (TVFA'S) concentration estimated using steam distillation methods (Warner, 1964) [47] and microbial protein measured by sodium tangistate method according to Shultz and Shultz (1970) [41].

In vitro gas production was undertaken according to the procedure described by Menke and Steingass (1988) [27]. Samples (200 mg) of the air-dry feedstuffs were accurately weighted into 50 ml calibrated glass syringe fitted with plungers. The rumen contents were kept in a water bath at 39ºC with CO_2 saturation until inoculation took place. The buffer and inoculum (2:1 v/v) were mixed and kept in a water bath at 39ºC with CO_2 saturation (Onodera and Henderson, 1980) [33]. All laboratory handling of rumen fluid was carried out under a continuous flow of CO_2. Buffered rumen fluid (15ml) was pipetted into each syringe, containing the feed samples, and the syringes were immediately placed into the water bath at 39ºC. Syringes were incubated *in vitro* in water bath for 96 h and gently shaken every 2hr. The syringes were continuing incubation up to 96 h and gas production was recorded at 3, 6, 9, 12, 24, 72 and 96 h of incubation *in vitro*. Total gas values were corrected for blank incubation which contains only rumen fluid.

The cumulative gas production (Y) at time (t) was fitted to the exponential model of (Ørskov and McDonald, 1979) [34].

$$\text{Gas}(t) = a+b \times (1-\exp^{-ct})$$

where: a = the gas production from the soluble fraction (ml),
b = the gas production from the insoluble fraction (ml),
c = the gas production rate (ml/h), and t = incubation time (h).
The energy values were calculated from the amount of produced gas at 24hr of incubation with supplementary analyses of crude protein, ash and crude fat. (Menke *et al*., 1979; Menke and Steingass, 1988) [26, 27].

ME (MJ /Kg DM) = 1.06+ (0.157* GP at 24 h) + (0.084*CP) + (0.22* EE) –0.08* A

OMD (%) = 14.88+0.889*gas at 24h+0.45*CP+0.0651*A

NE (Mcal/lb) = ((2.2+ (0.0272*GAS at 24h) + (0.057*CP) + (0.149*EE))/14.64

where:
ME is the metabolizable energy,
OMD is organic matter digestibility,
GP is 24 h net gas production (ml/200 mg DM),
A is ash (% of DM),
NE is the net energy, and
EE is ether extract or crude fat (%of DM).
Short chain fatty acids (SCFA) were calculated according to the Getachew *et al*. (2005) [15] using the following equation:

SCFA= (- 0.00425+0.0222*GP at 24h)*100

where: GP is 24 h net gas production (ml/200 mg DM).
Microbial protein was calculated as 19.3 g microbial nitrogen per kg OMD according to Czerkawski (1986) [9].
Methane volume, carbon dioxide volume and the percentage of methane in the total gas were determined according to (Fievez *et al*., 2005) [14].

Statistical analyses

Data of growth statistically analyzed according to SAS (2003) [38]. The difference between means was tested by Duncan' s Multiple Range Test (Duncan, 1955) [11]. The used model was:

Yij+ μ+Ti+eij

where:
Yij= The observation on the 1^{th} treatment.
μ= Overall mean.
Ti= Effect of the1^{th} treatment.
eij = experimental error.

RESULTS AND DISCUSSIONS

Concentration of pesticides residues of watermelon vine:

The Concentration of pesticides residues of untreated and treated watermelon vine with *Trichoderma reesie* are presented in (Table 2). The treated watermelon vine with *Trichoderma reesie* showed lower values of pesticides residues compared with untreated one.

Table 2. Concentration (mg/kg) of pesticides residues of watermelon vine

Items	Water melon vine hay	
	Untreated watermelon vine (WMVH)	Watermelon vine treated with fungi (WMVF)
Permethin	0.86	0.17
Malathion	0.69	0.14
Acetamiprid	0.36	0.06
HCB	0.16	0.02
Lindine	0.23	0.06
***PP* DDE**	0.11	0.01

Source:WMVH: Watermelon vine hay (untreated water melon vine); WMVF: Watermelon vine treated with fungi

Milk yield and its compositions

Data concerning milk yield and its composition of lactating goats fed the experimental rations are presented in Table (3). The milk yield and fat corrected milk (FCM) were significantly increased (P<0.05) for R1 and R4 compared with the other experimental groups R2, R3 and R5. Milk fat and protein yield were also significantly increased (P<0.05). Concerning milk composition and milk produced from animals fed R1 and R4 had significantly (P<0.05) higher contents of fat, protein, lactose, total solids (TS) and solids not fat (SNF) compared with the other experimental groups.

Concentrations of pesticides residues (μg/kg on fat basis) in milk

The concentrations of pesticides residues (µg/kg on fat basis) of the watermelon in milk are presented in (Table 4). The pesticides residues in milk of goats fed rations contain WMV untreated (R3 and R2) showed high values of pesticides residues compared with other rations. But the pesticides residues in milk of goats fed rations R1, R4 and R5 were none detected.

Table 3. Milk yields and milk composition for lactating goats fed the experimental rations

Items	**R1**	**R2**	**R3**	**R4**	**R5**	**SEM**	***P Value***
Live body weight (kg)	30.525	30.625	30.550	30.600	30.620	1.23	0.648
Milk yields (g/d)	914.75^{a}	739.42^{b}	539.74^{d}	934.62^{a}	619.62^{c}	41.62	< 0.001
4% FCM (g)	808.85^{a}	657.12^{b}	478.70^{d}	818.50^{a}	555.65^{c}	45.99	< 0.001
Fat, (g/d)	29.53 ^{a}	24.09^{b}	17.52^{c}	29.64^{a}	20.52^{bc}	1.68	0.001
Protein, (g/d)	28.99^{a}	23.68^{bc}	15.84^{d}	29.15 ^{a}	19.55 ^{dc}	1.31	< 0.001
Milk composition (%)							
Total solids	13.92 ^{a}	13.45^{b}	13.14^{c}	13.99 ^{a}	13.41 ^{b}	0.077	0.021
Solids not fat	10.46 ^{a}	10.14 ^{b}	9.95^{c}	10.55 ^{a}	10.15 ^{b}	0.061	0.016
Fat	3.46 ^{a}	3.31 ^{b}	3.19 ^{c}	3.44 ^{a}	3.26 ^{b}	0.084	0.019
Protein	3.44 ^{a}	3.23 ^{b}	2.87 ^{c}	3.41 ^{a}	3.10 ^{b}	0.078	0.01
Lactose	6.23^{a}	6.04 ^{c}	6.09 ^{bc}	6.26^{a}	6.12 ^{b}	0.066	0.027
Ash	0.79 ^{c}	0.87 ^{b}	0.99 ^{a}	0.88 ^{b}	0.93 ^{a}	0.023	0.012

Source:FCM: fat corrected milk

$^{a,,b,c\ and\ d}$ *Means within rows with different superscripts are significantly different (P<0.05).* S.E *(stander error*

R1: *50% CFM + 50% BH as control ration.*
R2: *50% CFM + 25% BH+25% WMVH (untreated WMV).*
R3: *50% CFM + 50% WMVH (untreated WMV).*
R4: *50% CFM + 25% BH+25% WMV treated with fungi (Trichoderma reesie).*
R5: *50% CFM + 50% WMV treated with fungi (Trichoderma reesie).*

Concentrations of pesticides residues (µg/kg on fat basis) in milk:

The concentrations of pesticides residues (µg/kg on fat basis) of the watermelon in milk are presented in (Table 4). The pesticides residues in milk of goats fed rations contain WMV untreated (R3 and R2) showed high values of pesticides residues compared with other rations. But the pesticides residues in milk of goats fed rations R1, R4 and R5 were none detected.

Table 4. Concentrations of pesticides residues (µg/kg on fat basis) of the milk goat's samples

Items	**R1**	**R2**	**R3**	**R4**	**R5**
Permethrin	ND	0.09	0.15	ND	ND
Malathion	ND	0.11	0.14	ND	ND
Acetamiprid	ND	0.001	0.08	ND	ND
HCB	ND	0.002	0.01	ND	ND
Lindine	ND	0.001	0.02	ND	ND
p.p' DDE	ND	0.001	0.005	ND	ND

R1: *50% CFM + 50% BH as control ration.*
R2: *50% CFM + 25% BH+25% WMVH (untreated WMV).*
R3: *50% CFM + 50% WMVH (untreated WMV).*
R4: *50% CFM + 25% BH+25% WMV treated with fungi (Trichoderma reesie).*
R5: *50% CFM + 50% WMV treated with fungi (Trichoderma reesie).*

Rumen Parameters

Consequently, higher levels of total volatile fatty acids (TVFA), acetate to propionate ratio (A:P) and variable ammonia nitrogen (NH_3-N) are produced (Table 5). Resulted indicated that rumen liquor pH values did not significantly differ among treatments.

The NH_3-N and TVFA's concentrations was

significantly (P < 0.05) higher in R1 and R4 than the other experimental ration. R3 had the lowest value (P<0.05) of NH_3-N and TVFA's concentration.

Table 5. Rumen liquor parameters of lactating goats fed the experimental diets

Items	R1	R2	R3	R4	R5	SEM	*P Value*
pH	6.32	6.29	6.17	6.23	6.20	0.11	0.847
NH_3-N (mg/100 ml)	13.64[a]	13.47[ab]	12.08[c]	13.70[a]	12.99[b]	0.18	0.031
TVFA's (meq/100 ml)	10.99[a]	9.09[b]	8.33[c]	10.61[a]	9.12[b]	0.36	0.026
Acetate (meq/100 ml)	55.31[c]	57.35[ab]	57.97[a]	55.79[c]	56.11[bc]	0.47	0.033
Propionate (meq/100 ml)	26.34[a]	24.37[b]	22.85[c]	26.86[a]	24.00[b]	0.31	0.016
Butyrate (meq/100 ml)	7.70[b]	8.88[a]	9.07[a]	7.83[b]	7.93[b]	0.28	0.041
Acetate: propionate ratio	2.10[c]	2.53[a]	2.54[a]	2.08[c]	2.34[b]	0.11	0.013
Gas production volume at 24 h	23.6[b]	20.4[c]	18.1[d]	28.2[a]	21.3[c]	1.34	0.001
CO_2	45.78[b]	48.08[a]	48.31[a]	45.86[b]	45.95[b]	0.49	0.027
CH_4	24.92[d]	27.02[a]	27.81[a]	25.97[c]	26.02[b]	0.21	0.011
Organic matter digestibility (OMD)	39.09[b]	35.97[c]	33.30[d]	43.47[a]	36.66[c]	2.27	0.001
Microbial protein	75.45[b]	69.41[c]	64.28[d]	83.90[a]	70.75[c]	3.11	0.001
Metabolizable energy (ME)(MJ /Kg DM)	5.03[b]	4.46[c]	3.99[d]	5.64[a]	4.41[c]	0.38	0.014
Net energy (NE) (Mcal/lb)	2.34[a]	2.24[b]	2.13[c]	2.41[a]	2.21[b]	0.07	0.036
Short chain fatty acids	51.97[b]	44.86[c]	39.76[d]	62.18[a]	46.86[c]	2.65	0.001

[a,,b, and c] *Means within rows with different superscripts are significantly different (P<0.05).*

R1: *50% CFM + 50% BH as control ration.*
R2: *50% CFM + 25% BH+25% WMVH (untreated WMV).*
R3: *50% CFM + 50% WMVH (untreated WMV).*
R4: *50% CFM + 25% BH+25% WMV treated with fungi (Trichoderma reesie).*
R5: *50% CFM + 50% WMV treated with fungi (Trichoderma reesie).*
NH3-N: Ammonia nitrogen; TVFA: Total volatile fatty acids

Feed intake, feed conversion and economic evaluation:

Data of feed intake, feed conversion and economic evaluation of the experimental rations are presented in Table (6). Results revealed that daily feed cost of experimental groups had lower values for untreated and treated WMV for different ratios (25 and 50 %) than control one. TDMI and fat corrected milk yield were higher (P<0.05) in both R1and R4 than R2, R3 and R5 groups. R4 group recorded the best value (P<0.05) of feed conversion compared with other experimental groups.

Biological treatment with *Trichoderma resei* is reported to be highly effective in reducing the level of pesticides. Hassan *et al.* (2010) [17] showed that biological treatment with fungi or bacteria could be advisable in order to overcome the harmful effect of tomato haulms exposure to pesticide. Sharaf *et al.* (2006) [39] reported that understanding pesticide metabolism in plants and microorganisms is necessary for pesticide development for safe and efficient use, as well

as for developing pesticide bioremediation strategies for contaminated soil and water. Andersson and Henrysson, (1996) [2] showed pesticide biotransformation may occur via multistep processes know as metabolism or co-metabolism. To increase the levels of degradation in soil, some researchers have inoculated polluted soils with various fungal species immobilized on different lignocellulosic supports (e.g woodchips, corncobs, and wheat straw).

Table 6. Feed intake, feed conversion and economic evaluation for lactating goats fed the experimental rations

Items	R1	R2	R3	R4	R5	SEM	*P Value*
CFM	500	500	500	500	500	0.0	-
BH	543.75	330	-	303.75	-	-	-
WMVH	-	124.58	284.58	211.25	389.17	-	-
TDMI (g/h/d)	1043.75[a]	954.54[b]	784.58[d]	1015.00 [a]	889.17 [c]	52.24	< 0.001
Milk yields g/d	914.75[a]	739.42[b]	539.74[d]	934.62[a]	619.62[c]	41.62	0.001
4% FCM (g)	808.85[a]	657.12[b]	478.70[d]	818.50[a]	555.65[c]	45.99	0.001
Feed conversion (g/g)							
TDMI / Milk yields (g /g)	1.14 [c]	1.29 [b]	1.45 [a]	1.09 [c]	1.44 [a]	0.39	0.012
TDMI/FCM (g/g)	1.29 [c]	1.45 [b]	1.64 [a]	1.24 [c]	1.60 [a]	0.99	0.007
Economic evaluation							
Daily feed cost, L.E	2.39	2.15	1.44	2.14	1.50	-	-
Price of daily milk yield, L.E	9.15	7.39	5.40	9.35	6.20	-	-
Economic return, L.E	6.76	5.24	3.96	7.21	4.70	-	-
Economic return,(h/d) %	100	77.51	58.58	106.66	69.53	-	-

[a,,b, c and d] *Means within rows with different superscripts are significantly different (P<0.05)*
Source:CFM: Concentrate feed mixture; BH: Berseem hay; WMVH: Watermelon vine hay
TDMI: Total dry matter intake:. FCM: fat corrected milk

Regarding average milk yield and its composition contents, the current results are in accordance with those reported by Saleh *et al*. (2003) [36] who indicated that yield of milk, fat corrected milk (FCM), fat, protein, total solids and solids not fat (SNF) recorded significantly (P <0.05) higher values for animal fed rations contain WMVH. The same results reported by Hassan *et al*. (2010) [17] he showed that the increase in milk yield may be due to higher DMI or slight increase of milk lactose, which had a positive correlation with milk yield. Further, Fazaeli *et al*. (2004) [13] reported that inclusion of fungal treated straw upto 30% of the total mixed ration in late lactating Holstein cows improved the nutrients digestibility and also noted an increase in fat corrected milk yield by 13%.
Biological treatment with fungi (*Trichoderma resei*) is reported to be highly effective in reducing the level of pesticides. Hassan *et al.* (2010) [17] showed that biological treatment with fungi or bacteria could be advisable in order to overcome the harmful effect of tomato haulms exposure to pesticide. DebManadal *et al*. (2008) [10] reported that microbes (fungi, bacteria, and other microorganisms) could degrade or breakdown the pesticides whereas they used them as food source. Quintero *et al*. (2008) [35] showed that white fungi species have demonstrated a

high capacity to degrade organic pollutants such as the insecticide lindane (y-HCH).

Fermentation pattern observed with fungal treated substrates upon microbial digestion favourably altered ruminal parameters because of biodelignification by WMVH which enables faster accessibility by rumen microbes. Hassan *et al*. (2010) [17] reported that it could be a result of proteolytic activity in the rumen. Yadov and Yaday (1988) [48] noticed that increased ruminal NH_3-N concentrations may due to the higher intake of nitrogen and CP digestibility. Bassiouni, (2001) [4] reported that watermelon vine hay (WMVH) had higher nutritive value, dry matter and protein degradability, as well as, it was better utilized than both wheat straw and rice straw by ruminants. Tripathi *et al*. (2008) [44] found that bio-processed mustard straw with *C. versicolor* (21 days) increased rumen pH and TVFA after 6h of feeding in sheep. Further, cultured straw increased small holotricks but reduced large holotricks population in rumen liquor, while no effect on ruminal microbial enzyme activities was observed. These studies imply that most of the microbially converted feeds are safer and the potential biohazards associated with them are very low (Villas-Bôas *et al*., 2002) [46] for ruminants. Molar proportions of individual VFA and the acetate to propionate ratio were significantly affected by feeding the experimental rations which increased the propionate proportion and decreased the acetate and butyrate proportions for R4 without significant difference with control group (R1). Consequently, there was a decrease in the acetate to propionate ratio compared with control. Enteric methane (CH_4) production arises principally from microbial fermentation of hydrolyzed dietary carbohydrates such as cellulose, hemicellulose, pectin and starch. The amount of CH_4 produced during ruminal fermentation is dependent upon the nature of the substrate being fermented. Diet composition alters the digestion efficiency of animals thereby CH_4 production. In general, methanogenic potential of ruminal microflora is greatest for the fermentation of structural carbohydrates compared to that of non-structural carbohydrates (Boadi *et al*., 2004) [7]. The goats fed R1, R4 and R5 had significantly ($P<0.05$) lower values for CO_2 and CH_4 compared with R2 and R3 groups. The gas production volume at 24h, organic matter digestibility, microbial protein, metabolizable energy, net energy and short chain fatty acids were significantly ($P<0.05$) higher in R4 than the other experimental ration. These results agree with Menke *et al*. (1979) [26] suggested that gas volume at 24 h after incubation is in indirect relationship with metabolisable energy in feedstuffs. Sommart *et al*., (2000) [42] suggested that gas volume is a good parameter to predict digestibility, fermentation of end-product and microbial protein synthesis of the substrate by rumen microbes in the *in vitro* system. Report elsewhere (Chumpawadee *et al*., 2007) [8] indicated that *in vitro* dry matter and organic matter digestibility were shown to have high correlation with gas volume. Gas volume has also shown to have a close relationship with feed intake (Blümmel *et al*., 1997) [6]. The higher gas volume recorded in the R4 group was likely to have been caused by its reduced contents of cell wall, especially ADF and ADL. Lignin has been implicated in rations with depressed digestibility (Van Soest, 1994) [45] due to its effect on lowering the rate of microbial colonization of such high fibre feed (Okano *et al*., 2009) [32]. This implies good digestibility potential for the fungal treated rice straw when harnessed as feed resources for ruminant livestock. Although gas production is a nutritionally wasteful product (Mauricio *et al*., 1999) [25], but provides a useful basis from which metabolisable energy (ME), organic matter digestibility (OMD) and short chain fatty acids (SCFA) may be predicted. High OMD was observed in R4 suggesting that the microbes in the rumen and animal have high nutrient uptake. The higher fibre content in control probably resulted in lower OMD since high NDF and ADL content in feedstuffs result in lower fibre degradation (Van Soest, 1994) [45]. Higher production of gas and the eventual preponderance of SCFA in the R4 probably showed an increased

proportion of acetate and butyrate but may mean a decrease in proximate production. The estimated ME was found to be comparable to that reported for fungal treated millet stover (Akinfemi *et al*., 2010) [1]. The *in vitro* gas production method has been widely used to evaluate the energy value of several classes of feed (Getachew *et al*., 2002) [16]. Others (Krishnamoothy *et al.*, 1995) [20] suggested that *in vitro* gas production technique should be considered for estimating ME in tropical feedstuffs. Evaluating ME using *in vitro* technique reduces cost, time and is comparable to those evaluated by *in vivo* method.

As cell wall components (NDF and ADF) are known to have a negative correlation with gas production (Sallam *et al*., 2007) [37], and thus readily available soluble carbohydrate fractions found in fungal treated substrates are expected to produce more gas (Chumpawadee *et al*., 2007) [8] and short chain fatty acids (SCFA), with an increased ME contents (Mahesh, 2012) [22]. Mahesh (2012) [22] observed a reduction in CH_4 (%) from fungal treated wheat straws which contained lesser fibre fractions (NDF and ADF) than untreated straw. This could probably due to indirect effect via fibre digestion leading to lesser residency of feed particles in the rumen (Sallam *et al*., 2007) [37]. The role of quality forages in reducing enteric CH_4 production in ruminants has been evident from several studies (Mohini *et al*., 2007) [28]. It can be concluded that enteric CH_4 emissions are highest when the animal is presented with poor quality forages. Thus, by fungal treatment, an improvement in the forage quality with respect to cell wall digestion and overall enhancement in carbohydrates digestibility as well as increased DM intake will be expected to reduce the CH_4 emissions relative to nutrients digestibility, in ruminants (Mahesh, 2012) [22].

The substitution of berseem hay by treated WMV with fungi resulted in better economic evaluation expressed as economic return. Saleh *et al*. (2003) [36] showed that better economic efficiency obtained in rations contained WMV may be due to the decreasing in feed cost of these rations compared to control ration. The best relative economic efficiency value was detect with (R4) being 109.72 when compared with the control group (100%) because their higher milk production. The same trend was observed by Bendary *et al*. (1996) [5]. Hassan *et al*. (2010) [17] showed that biological treatment with fungi or bacteria could be advisable in order to overcome the harmful effect of tomato haulms exposure to pesticides.

CONCLUSIONS

Conclusively, it could be concluded that biological treatment with fungi could be advisable in order to overcome the harmful effect of watermelon vine exposure to pesticide. The present study suggested the possibility of replacing berseem hay by treated WMV with fungus in rations of lactating goats up to 25% as a cheap ingredient. Moreover, it could be used safely and economically in formulating ruminants.

REFERENCES

[1]Akinfemi, A., Jonathan, S.G., Adu, O.A., 2010, Improving the nutritive value of millet stover using biological treatment. Libyan Agriculture Research Centre Journal International, vol. 1, no. 3, p. 195-201.

[2]Andersson, B.E., Henrysson, T., 1996, Accumulation and degradation of dead-end metabolites during treatment of soil contaminated with polycyclic aromatic hydrocarbon with five strains of white-not fingi. Applies Microbiology and Biotechnology, 46; 647-652.

[3]AOAC, 2000, Official Methods of Analysis, 17th ed. Association of Official Analytical Chemists, Arlington, VA, USA.

[4]Bassiouni, M.I., 2001, Using quick methods for evaluation of some tradition and nontraditional Egyptian roughages as feedstuffs for ruminants. Egyptian J. Nutrition and feeds. 5(1): 147-164.

[5]Bendary, M.M., Mohamed, M., Ghenim, G.H.A., Abou Selim, I.A., 1996, Nutritional studies on using sugar beet tops in animal feeding. 5. Performance of lactating Friesian cows fed dried sugar beet tops and its silage. Egyptian .J. Anim. Prod., 33:199.

[6]Blümmel, M., Makkar, H.P.S., Becker, K., 1997, *In vitro* gas production: a technique revisited. J. Anim. Physiol. Anim. Nutr. 77:24-34.

[7]Boadi, D., Benchaar, C., Chiquette, J., Masse, D., 2004, Mitigation strategies to reduce enteric methane

emissions from dairy cows: Updated review. Can. J. Anim. Sci. 84:319-335.
[8]Chumpawadee, S., Chantiratikul, A., Chantiratikul, P., 2007, Chemical composition and nutritional evaluation of energy feeds for ruminant using in vitro gas production technique. Pak. J. Nutr. 6:607-612.
[9]Czerkawski, J. W., 1986, An introduction to rumen studies. Pergamon Press. Oxford. New York.
[10]DebManadal, M., Shyamaph, M., Nishith, K., 2008, Potential metabolites of dimethoate produced by bacterial degradation.World Journal of Microbiology and Biotechnology, 24:69-72.
[11]Duncan, D. B. (1955). Multiple ranges and multiple F-test. Biometrics, II: 1-42.
[12]El-Ashry, M.A., Kollif, A.M., Fadel,M., El-Alamy, H.A., El-Sayed, H.M., 2003, Effect of biological treatments on chemical composition *in vitro* and *in vivo* nutrients digestibility of poor quality roughages. Egyptian J. Nutrition and feeds, 6 (2):113-126.
[13]Fazaeli, H., Mahmodzadeh, H., Jelan, Z.A., Rouzbenhan, Y., Liang, J.B., Azizi, A., 2004, Utilization of fungal treated wheat straw in the diet of late lactating cow. Asian-Aust. J. Anim. Sci. 2004. 17:467-472.
[14]Fievez, V., Babayemi, O.J., Demeyer, D., 2005, Estimation of direct and indirect gas production in syringes: A tool to estimate short chain fatty acid production that requires minimal laboratory facilities, Animal Feed Science and Technology. 123–124: 197–210.
[15]Getachew, G., De Peters, E., Robinson, P., Fadel, J., 2005, Use of in vitro rumen gas production techniques to evaluate microbial fermentation of ruminant feeds and its impact on fermentation products. Anim. Feed Sci. Technol. 124: 547-559.
[16]Getachew, G., Crovetto, G.M., Fondivila, M., Krishnamoorthy, U., Singh B., Spaghero, M., Steingass, H., Robinson P.H., Kailas, M.M., 2002, Laboratory variation of 24 h in vitro gas production and estimated metabolizable energy values of ruminant feeds. Animal Feed Science Technology 102: 169-180.
[17]Hassan, A. A., Khalel, M. S., Shwerab, A. M., Yacout, M. H., Borhami, B. E. E., Ibrahim, H. Z., 2010, Microbial degradation of pesticides residues in tomato haulms and their effects on performance of dairy cows. Egyptian Journal of Nutrition and Feeds, 13(3), 485-505.
[18]Ibrahim, A.M., Ragub, A.A., Morsey, M.A., Hewedi, M.M., Smith, C.J., 1994, Application of an aldrin and dielrin ElISA to the detection of pesticides in eggs.Food Agric.Immunol.6:39-44.
[19]Khorshed, M. M., 2000, Different treatments for improving nutritional quality of some crop residues used in ruminant nutrition. Ph. D. Thesis, Fac. of Agric. Ain-Shams Univ.
[20]Krishnamoorthy, U. Soller, H. Steingass, H., Menke, K. H., 1995, Energy and protein evaluation of tropical feedstuffs for whole tract and ruminal digestion by chemical analysis and rumen inoculum studies in vitro. Anim. Feed. Sci. Tech., 1995, vol. 52, p. 177.
[21]Liu,Y.Y., Xiong, Y., 2001, Purification and characterization of a dimethoate- deggrading enzyme of *Aspergillus niger* ZHY256 isolated from sewage. Applied Environmental Microbiology,67: 3746-3749.
[22]Mahesh, M.S., 2012, Fungal bioremediation of wheat straw to improve the nutritive value and its effect on methane production in ruminants. MVSc thesis submitted to National Dairy Research institute (Deemed University), Karnal, Haryana, India.
[23]Mansour, S.A., 2008, Environmental impact of pesticides in Egypt. Rev. Contam Toxicol. 196:1-51.
[24]Matsumura, F., 1985, Toxicology of insecticides. Second Edition Plenum press. New York. p410.
[25]Mauricio, R.M., Mould, F.L., Dhanoa, M.S., Owen, E., Channa, K.S., Theodorou, M.K., 1999, A semi-automated in vitro gas production technique for ruminant feedstuff evaluation. Anim. Feed Sci. Technol. 79, 321–330.
[26]Menke, K. H., Raab, L., Salewski, A., Fritz, D., Steingass, H. W., 1979, The estimation of the digestibility and metabolisable energy content of ruminant feedstuffs from the gas production when they are incubated with rumen liquor. *J. Agric. Sci.*, 1979, vol. 93, p. 217.
[27]Menke, K.H., Steingass, H., 1988, Estimation of the energetic feed value obtained from chemical analysis and gas production using rumen fluid. Anim. Res. Dev. 28, 7–55.
[28]Mohini, M., Mani, V.,Singh, G.P., 2007, Effect of different ratios of green and dry roughages on milk production and methane emission in cattle. Indian J. Anim. Sci. 77:79-82.
[29]Njiru, J. N., 1996, Safety of feeding crop residues with pesticides to dairy cattle in a mixed farming irrigation scheme in central Kenya., Ms. C. of Science, Fac. of Agric. and Vet., Sci., Nairobi Univ.
[30]NRC., 2001, Nutrient requirements of dairy cattle, 7th edition, National Academy Press, Washington DC, USA.
[31]Ntow, W.J., 2003, Organochlorine pesticides in water, sediment, crops, and human fluids in a farming community in Ghana. Food Addit. Contam. 20 (3): 270-275.
[32]Okano, K., Ohkoshi, N., Nishiyama, A., Usagawa, T., Kitagawa, M., 2009, Improving the nutritive value of madake bamboo, *Phyllostachys bambusoides*, for ruminants by culturing with the white-rot fungus *Ceriporiopsis subvermispora*. Anim. Feed Sci. Technol. 152:278–285.
[33]Onodera, R., Henderson, C., 1980, Growth factors of bacterial origin for the culture of the rumen oligotrich protozoon, Entodinium caudatum. J. Appl. Bacteriol., 48, 125-134.
[34]Ørskov, E. R., Mc Donald, I., 1979, The estimation of protein degradability in the rumen from incubation measurements weighted according to rate of passage. J. Agric. Sci. Cambridge. 92: 499-503.
[35]Quintero, J. C., Moreira, M. T., Feijoo, G., Lema, J. M., 2008, Screening of white rot fungal species for their capacity to degrade lindane and other isomers of

hexacchlorocychexane (HCH). Cien. Inv. Agr. 35(2):159-167.
[36]Saleh M.S; A.M. Metwally; M .I. Bassiouni, M.A.El-Shora, 2003, Utilization of watermelon vine in feeding ruminants II-Effect of replacing berseem hay by watermelon vine hay in feeding lactating buffaloes. Egyptian Journal of Nutrition and Feeds 6: 617-626.
[37]Sallam, S.M.A., Nasser, M.E.A., El-Waziry, A.M., Bueno, I.C.S., Abdalla, A.L., 2007, Use of an *in vitro* ruminant gas production technique to evaluate some ruminant feedstuffs. J. Appl. Sci. Res. 3:33-41.
[38]SAS, 2003, SAS User's Guide: Statistics.. SAS Inst., Inc., Cary, NC. Releigh.
[39]Sharaf, A.N., Soliman, M.H., Ibrahim, M.A., Moustafa, S.A., Abd El-Hadi, A .A., 2006, Molecular identification and cloning of organophosghate degradation gene in some bacterial isolates. Arab Journal Biotechnology, 10; 259-274.
[40]Shultz, T.A., Shultz, E., 1970, Estimation of rumen microbial nitrogen by three analytical methods. J. of Dairy Sci., 53(6):781-784.
[41]Sommart, K., Parker, D. S., Rowlinson. P., Wanapat, M., 2000, Fermentation characteristics and microbial protein synthesis in an *in vitro* system using cassava, rice straw and dried ruzi grass as substrate. *Asian-Australasian Journal of Animal Science*, Vol. 13, p. 1084-1093.
[42]Soejitno, J., 2002, Pesticide residues on food crops and vegetables in Indonesia. J. Libang Pertanian. 21 (4): 124 – 132.
[43]Tripathi, M.K., Mishra, A.S., Misra, A.K., Vaithiyanathan, S., Prasad, R., Jakhmola, R.C., 2008, Selection of white-rot basidiomycetes for bioconversion of mustard (*Brassica compestris*) straw under solid-state fermentation into energy substrate for rumen micro-organism. Lett. Appl. Microb. 46:364–370.
[44]Van Soest, P.J., 1994, Nutritional Ecology of the Ruminant, second ed. Cornell University Press, Ithaca, NY. pp. 177.
[45]Villas-Bôas, S.G., Esposito, E., Mitchell, D.A., 2002, Microbial conversion of lignocellulosic residues for the production of animal feeds. Anim. Feed Sci. Technol. 98:1–12.
[46]Warner, A.C.I.,1964, Production of volatile fatty acids in the rumen: Methods of measurement. Nutr. Abstr. and Rev., 34:339.
[47]Yadov, B.P.S., Yaday, I.S., 1988, Incubation studies with strained rumen liquor of cattle for *in vitro* evaluation of ammoniated straw. Ind. J. Anim. Sci., 58:398-406.
[48]Yassin, M.M., Abu Mourad, T.A., Safi, J. M., 2002, Knowledge, attitude, practice and toxicity symptoms associated with pesticides use among farm workers in the Gaza Strip. Occup. Environ. Med. 59:387-394.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

COMPETITIVE ADVANTAGES OF BULGARIAN SUNFLOWER INDUSTRY AFTER THE ACCESSION INTO THE EUROPEAN UNION

Krum HRISTOV, Rositsa BELUHOVA-UZUNOVA, Mariyana SHISHKOVA

Agricultural University – Plovdiv, 12 Mendeleev Blvd, Plovdiv, Bulgaria, Emails: krumhristov@abv.bg, rosicab_uzunova@abv.bg, mariyana.shishkova@gmail.com

Corresponding author: rosicab_uzunova@abv.bg

Abstract

After the accession to the EU the oilseed crops, especially sunflower and rapeseeds, are becoming promising and advanced sector in Bulgarian agriculture. They account for more than 20% of total agricultural output and dominate in structure of Bulgarian export. Bulgaria and Romania are the largest sunflower seed producers in the EU, with sunflower yields increasing twice over the past ten years. The results in the sector are good starting point for a debate over its competitiveness and efficiency. The aim of the study is to analyze the competitive advantages of Bulgarian sunflower industry and to outline opportunities and challenges for post 2020 period. The sector is observed in terms of production, consumption and trade. Several of the commonly used indicators for the evaluation of competitive advantages have been applied such as the Relative index of export advantages – RXA, the Relative trade advantage – RTA and Related competitiveness – RC. The results show that sunflower seed will continue to dominate in Bulgarian agricultural structure regardless the dynamic of international prices and production. The difficulties in Bulgarian livestock are reflecting the sector and causing dependence on export and foreign trade.

Key words**:** *competitiveness, CAP, efficiency, sunflower industry, Bulgaria*

INTRODUCTION

After the accession to the EU sunflower and rapeseeds, are becoming promising and advanced sectors in Bulgarian agriculture. They account for more than 20% of total agricultural output and dominate in structure of Bulgarian export. On one hand the sunflower is used for a well-balanced crop rotation with the cereals (wheat, maze, etc.) therefor it could be grown on large areas. On the other hand the sunflower is a relatively dry resistant crop, which in combination with the significant irrigation problems, which occurred in Bulgaria during the transition period (Penov *et al*., 2003), is a great advantage [16].

In recent years, the harvested area of sunflower seed in Bulgaria is about 6 million dca, which places it as the second most important crop right after the wheat. The significance of the sunflower is closely related to its export potential. The dynamics in the recent years is starting point for a debate over the competitiveness in the sector.

The aim of the study is to analyze the competitive advantages of Bulgarian sunflower industry and to outline the challenges and the opportunities for the post 2020 period.

The study is structured in tree main parts as follows: First section of the paper represents the theoretical background, materials and methods applied in the study. Second part outlines the production potential and the competitive advantages of the sunflower seed. Finally, some important conclusions concerning the competitive advantages of Bulgarian sunflower industry and some recommendations for the further development of the subsector are highlighted in the third part of the paper.

MATERIALS AND METHODS

The data is collected by FAO Database and Ministry of agriculture, food and forestry in Bulgaria for the period 1961-2016 [6, 7, 15].

In the scientific world the competitiveness has many definitions and dimensions. According to Latruffe (2014) agricultural competitiveness is defined as "the ability of an agricultural firm (including a farm) to face competition and to be successful" [12].

Competitiveness may be considered in the context of a domestic markets (in which case firms, or sectors, in the same country are compared with each other) or in an international context (in this case, comparisons are made between firms in different countries) (Keogh et.al. 2015) [10]. Kuneva and Angelova (2017) apply mathematical approach to analyze the links between subsectors and competitiveness [11]. Georgiev and Roycheva (2017) use new institutional approach for measuring the adaptation of Bulgarian agriculture [8]. Due to the complexity of the concept in theory and practice, no consensus has been reached on competitiveness definition and measurements (Latruffe, 2014) [12].

In agricultural sector the methodology of the study is based on the methodological framework proposed by Aleksiev (2012) [1].

First empirical study in the area of relative competitive advantages (RXA) is presented by Liesner (1958) [13]. Balassa (1965) [3] proposes an advanced measure of RXA which is among the most widely used indicator of competitiveness:

$$RXA = (X_{ii} / X_{it}) / (X_{nj} / X_{nt}) \quad (1)$$

Where X represents exports, i is a country, j is a commodity (or industry), t is a set of commodities (or industries), and n is a set of countries (Balassa, 1965) [3].

In many aspects, however, its use is limited and problematic (Benedictis and Tamberi, 2001; Hinloopen and Marrewijk, 2001) [4, 9]. The indicator observes only the export potential rather than trade balance.

Vollrath (1991) [17] modified the Balassa index and develops three alternatives for assessing the competitiveness. These indicators are called logarithmic relative advantage (lnRCA), the relative trade advantage (RTA), and the revealed competitiveness (RC).

The difference between the coefficients RXA and RMA is the relative trade advantage (RTA), commonly used indicator of comparative advantages:

$$RTA = RXA - RMA \quad (2)$$

The indicator Revealed competitiveness (RC) compares RXA and RMA in a logarithmic form (Vollrath, 1991) [17]:

$$RC = \ln RXA - \ln RMA \quad (3)$$

RESULTS AND DISCUSSIONS

The analysis of variations of sunflower production in the country could be divided into three main stages. The first period (1985-1989) could be characterized by significant fluctuations through the years and slow increase in the production. The aforementioned variations are due to the mutual effect of extensive and intensive factors. The main reasons for the insignificant average growth (around 9%) are related to the low comparative biological and technological advantages of sunflower production compare to other crops and the traditional use of animal fat in Bulgaria.

The dynamics in harvested area, yields and production for the period 1985-2017 are presented in Figure 1.

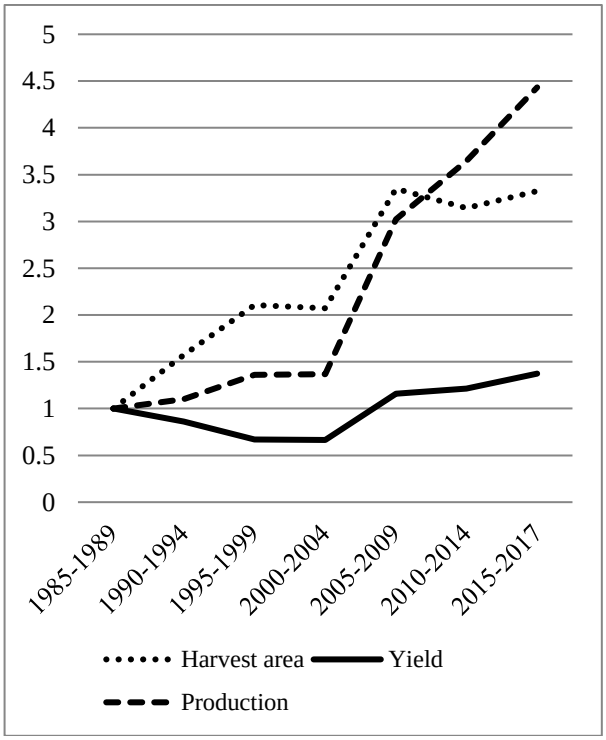


Fig. 1. Dynamics in harvested area, yields and production 1985-2017 (1985=1)
Source: Own calculation based on FAO [6].

The second stage is associated to the process of market transformations and the agricultural reform. In this period (1991-2000) is observed a significant increase in sunflower production due to the rapid expansion of the harvested area and the changes of agricultural specialization. The above-mentioned extensive factors compensate the decrease in the average yield. Therefore the increase of production in this period is over 40%. The observed variations in yields and production are determined not only by changes in weather conditions, but also by technological constraints during the transition period.

The production of sunflower in the pre-accession period and the EU membership is growing rapidly. Therefore, Bulgaria becomes one of the main producers and exporters of sunflower seed. The financial support of the CAP allowed the rapid technological development of sunflower industry.

Therefore, the production of sunflower in the last fourteen years increases nearly 3.5 times and the average annual growth is almost 10%, which causes significant increase in the export.

Figure 2 presents information for major sunflower producers in the past half century.

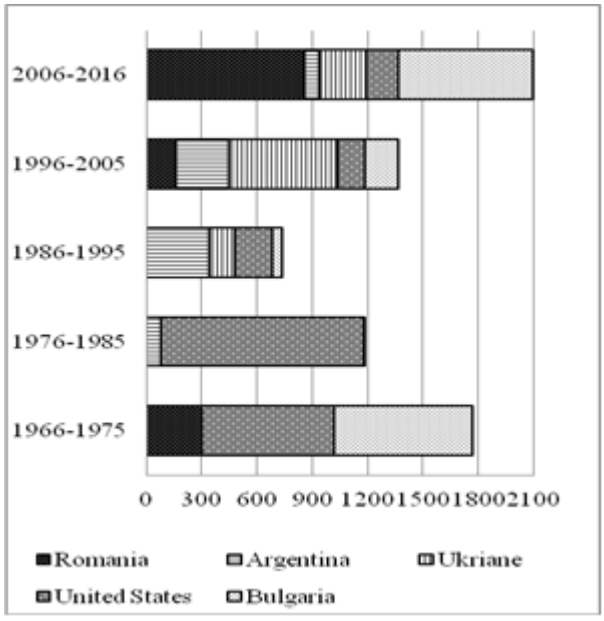


Fig. 2. Export of selected group of countries 1966-2016 (in thousand tones)

Source: Own calculation based on FAO [7].

*The data in Ukraine is available after 1992.

Due to the relatively high ecological plasticity of the sunflower, it is grown in large number of countries. During the analyzed period, the total sunflower seed production in the world has increased significantly and reached over 45 million tonnes. The development of world sunflower production however, is characterized by substantial regional changes, caused by the agricultural policy revisions over the years. Aforementioned reforms are determined by natural factors and also by consumers' preferences and the economic conditions.

The countries could be divided into two groups. The first group has expanded sunflower production over the past 30 years (Bulgaria and Romania). The second group includes countries that changed their policy (The USA and Argentina). In the first decades, this group also expanded the area and increased the production of sunflower seed. In 1979, nearly 22% of world production was concentrated in the USA. On the other hand, in 1999 Argentina provides 24% of sunflower seed production. These countries changed their policies and decreased both the harvested area and the production. This could be explained with the influence of the "green revolution" and the difficulties associated with the fight against diseases, pests and weeds. There are some changes in the consumer behavior over the years in this group of countries. Therefore, the sunflower oil is replaced by olive oil, corn oil and other more quality oils. At the beginning of the new century, the sunflower production is concentrated in Europe, with the largest producers in the Black Sea region.

The trends in the export of sunflower seed in the biggest producers show substantial variations. During the 70`s and 80`s the USA and Argentina played major role in export of sunflower. By contrast, after 1990 Bulgaria and Romania increased their export potential in parallel with the decline in the export quantity in the USA and Argentina.

The export structure of Argentina has changed in favor of the rapeseed production, while the USA increased the domestic consumption. Bulgaria and Romania are among the biggest

exporters in the word. In 2013, Bulgaria takes first place based on the indicator. The increase in export in Bulgaria is raising concerns about the future development of the sector and its high dependence on export.

Dynamics of production and domestic consumption of sunflower in Bulgaria determines the export potential. There are significant changes for the analyzed period of fifty-five years (Table 1).

In the first three decades of the period the sunflower production is growing gradually. The main reasons are associated with the technological development of the production processes. However, essential changes in the export quantity and its share are not observed. This trend is caused by the needs of the food processing industry and the forage production. The main priorities of Bulgarian trade policy during the 80's are associated with the export of high value products and decrease in the export of primary products and raw materials. Therefor the export of livestock products is stimulated.

Table 1. Share of the export in production of sunflower 1961-2016 (%)

Periods	Sunflower	Sunflower seed	Sunflower oil
1961-1970	14.25	22.98	14.24
1971-1980	7.25	4.15	22.14
1981-1990	6.78	4.21	17.29
1991-2000	15.88	20.87	10.92
2001-2010	32.85	48. 74	28.43
2011-2016	53.32	67.35	39.15

Source: Own calculation based on FAO and Ministry of agriculture, food and forestry [7, 15].

In the first three decades of the period the sunflower production is growing gradually. The main reasons are associated with the technological development of the production processes. However, essential changes in the export quantity and its share are not observed. This trend is caused by the needs of the food processing industry and the forage production. The main priorities of Bulgarian trade policy during the 80's are associated with the export of high value products and decrease in the export of primary products and raw materials. Therefore, the export of livestock products is stimulated.

There are significant changes in the trends and political priorities in the beginning of the transition period (Zlatinov, 2018) [18]. The harvested area and production are increasing as well as the share of the export of sunflower and sunflower oil. In the recent years over 60% of the sunflower production is exported. The changes of the trade policy, the decline in the sectors of livestock, fruit and vegetable production and the influence of the innovative technologies led to serious increase in sunflower seed export (Manolova, 2009; Atanasov and Popova, 2010; Dochev, 2016) [14, 2, 5]. This trend has not only positive but some negative dimensions related to the high dependency on the export. The changes in the share of the export show significant variations in Bulgarian international specialization. Bulgaria is exporting primary products and raw materials, while main sectors with export traditions (viniculture, fruit and vegetables etc.) are experiencing severe problems.

The dynamics of the comparative advantages in sunflower seed in the past 55 years are outlined by Balassa index (Fig. 3).

The results indicate that there are two stages of the development of sunflower comparative advantages in Bulgaria. In the first three decades (1961-1990) the comparative advantages of the country are declining. The main reasons are related to the policy perspective during the planned economy, which restricted export of raw materials and stimulated domestic consumption. In the past twenty-six years (1991-2016) due the increased production potential and the reduction of domestic consumption, the comparative advantages of the country in international trade are increasing.

Despite the serious problems in agriculture during the transition period and the production decline, sunflower prices on the world markets encourage its exports. In the last period the expansion of the harvested area and production led to a significant increase in the export. Therefore the Balassa index has the highest values.

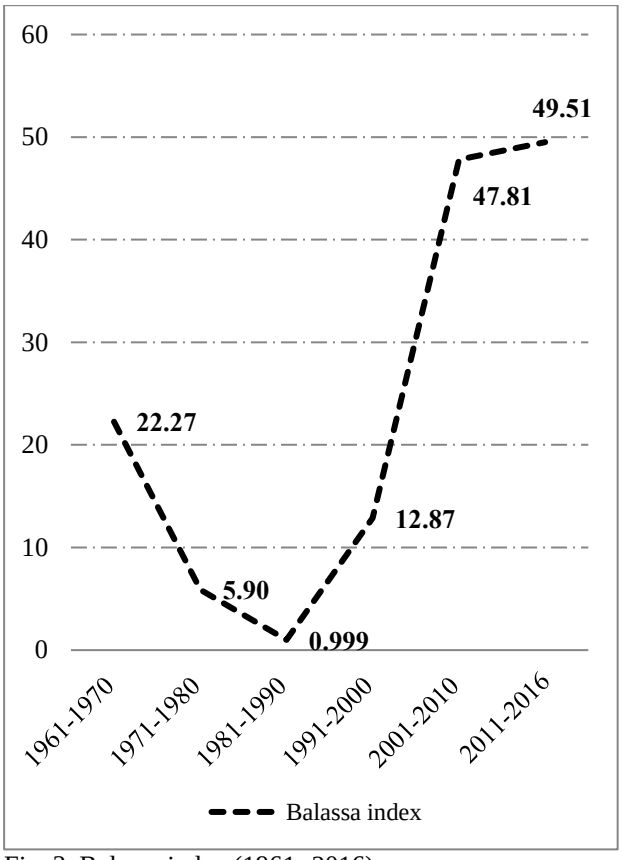


Fig. 3. Balassa index (1961- 2016).
Source: Own calculation based on FAO. [7].

The competitive advantages of sunflower production are analyzed by Vollrath indexes - relative trade advantage and relative competitiveness (Fig. 4).

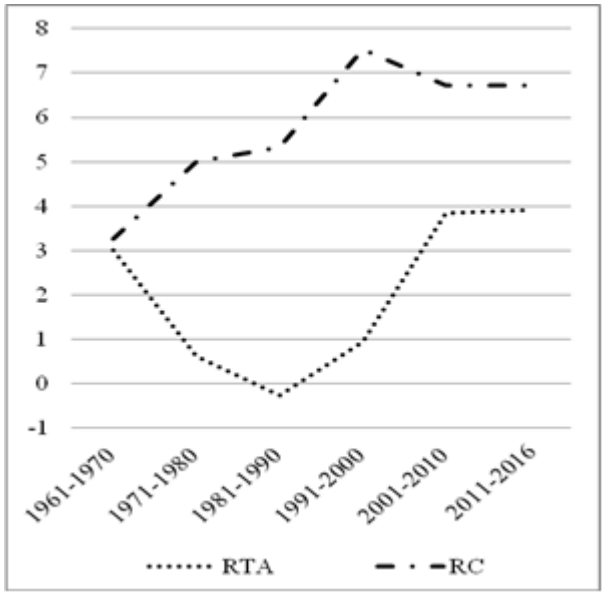


Fig. 4. Competitive advantages of sunflower production 1981-2016
Source: Own calculation based on FAO. [7].

The results correspond to the trends observed by Balassa index. The first three decades are associated with lower competitive advantages and serious variations. Negative values, related to the limited export of primary goods and rapid development of the livestock sector were registered in the last decade of the planned economy.

The opportunities of sunflower seed for participation in the international trade are declining in the first thirty years of the analyzed period, although the increase of the export prices.

The next decades are characterized by better opportunities in the international trade due to the intensive development of the innovative technologies. The main reason however, is the financial support under the CAP. The direct payments stimulate extensive crop producers and are causing serious changes in the specialization and the concentration of Bulgarian agriculture. Therefore, wheat and sunflower seed production is dominating the structure of Bulgarian agriculture.

The majority of agricultural holdings related to sunflower seed production are large farms that are specialized mainly in extensive farming. They accumulate significant financial support in form of direct payments and thus stimulate the establishment of imbalanced structure of Bulgarian agriculture.

The development of sunflower seed production over the past decades is a positive trend, but it should be linked to proceeding industry and livestock. The low processing and consumption in the country is one of the main reasons for the increase of the export potential in the country.

CONCLUSIONS

The analysis of the dynamics of harvested area, yields and production of sunflower seed in Bulgaria shows significant growth in the sector after the accession to the EU.

After the transition period there is serious change in the international specialization and the trade policy in Bulgaria.

In the recent years the increase of production is in parallel with the export growth.

The low domestic consumption in Bulgaria and the challenges in the sectors of livestock breeding, viniculture, fruits and vegetables lead to dominant role of sunflower and wheat in Bulgarian export list.

Despite some positive changes after the accession to the EU there is high dependence on the export that raises serious concerns about the sustainable development of Bulgarian sunflower industry.

Strong revision of the priorities of agricultural policy is recommended for the new programming period. The international specialization should be based on high value and proceeded products.

The results of the analysis indicate that Bulgaria is one of the leading countries in the production and the export of sunflower seed. In the forthcoming years we could expect a decrease of the export potential and an increase in the domestic consumption and the export of sunflower oil.

ACKNOWLEDGEMENTS

This survey is part of the project 05-18 "Impact of the agricultural structural changes on rural development in Bulgaria", financed by the Centre of Research, Technology transfer and protection of intellectual property rights at the Agricultural University-Plovdiv.

REFERENCES

[1]Aleksiev, A., 2012, Competitive Advantages of the Grain Sector. Monograph, Academic Publishing House of the Agricultural University, Plovdiv, pp. 89-101.

[2]Atanasov, D., Popova. B., 2010, Sustainable development characteristics of different dairy farms in Bulgaria. Trakia Journal of Science, Volume 8, Suplement 1, pp. 245-253.

[3]Balassa, B., 1965, Trade liberalization and "revealed" comparative advantages. The Manchester School, 33, pp.99-123.

[4]Benedictis, L., Tamberi, M., 2001, A note on the Balassa index of revealed comparative advantage. Dipartimento di Economia, Universita Politecnica delle Marche Working Papers, 158.

[5]Dochev, C. et.al., 2016, Herbicide control of wild hemp (Cannabis sativa L.) at sunflower grown by Express Sun technology, Proceedings of 7th International Scientific Symposium "AGROSYM 2016", Jahorina,6-9 October, Bosnia and Herzegovina

[6]FAO statistic division, FAOSTAT data Crops, http://www.fao.org/faostat/en/#data/QC, Accessed on 26.02.2019

[7]FAO statistic division, FAOSTAT data Trade Crops and livestock products, http://www.fao.org/faostat/en/#data/TP, Accessed on 26.02.2019

[8]Georgiev, M., Roycheva, A., 2017, New institutional economics and methods for measuring the adaptation of Bulgarian agriculture. Trakia Journal of Sciences, Vol. 15, Suppl. 1, Pages 199-205.

[9]Hinloopen, J., Marrewijk, C., 2001, On the empirical distribution of the Balassa index. Weltwirtschaftliches Archiv, 137(1), pp.1-35.

[10]Keogh, M, Tomlinson, A., Henry, M., 2015, Assessing the competitiveness of Australian agriculture, Publication No. 15/054 Project No. PRJ-009740, Rural Industries Research and Development Corporation, Australia, https://www.agrifutures.com.au/wp-content/uploads/publications/15-054.pdf, Accessed on 26.02.2019.

[11]Kuneva, V., Angelova, Z., 2017, Application of Linear algebra in Economics, Mathematics and Informatics, Vol. 60, № 4, pp. 401-404.

[12]Latruffe, L., 2014, Competitiveness in the Agricultural Sector: Measures and Determinants. Farm Policy Journal, Australian Farm Institute 11, 9-17.

[13]Liesner, H., 1958, The European Common Market and British Industry, Economic Journal, 68, 302-316.

[14]Manolova, V., 2009, Bulgarian and Romanian fruit growing: comparative analysis. Acta horticulturae, 825, 349-356, https://www.ishs.org/ishs-article/825_55, Accessed on 26.02.2019.

[15]Ministry of Agriculture, food and forestry, Agricultural reports for the period- 2007-2017 http://www.mzh.government.bg/MZH/bg/Documents/AgrarenDoklad.aspx, Accessed on 26.02.2019.

[16]Penov, I., Theesfeld, I., Gatzweiler, F. W., 2003, Volume 3: Irrigation and Water Regulation Systems in Transition: The Case of Bulgaria in Comparison with Latvia, East Germany and Romania, CEESA\FAO Series 18900, CEESA: Central and Eastern European Sustainable Agriculture International Research Project.

[17]Vollrath, T., 1991, A theoretical evaluation of alternative trade intensity measures of revealed comparative advantage. Welwirtsshaftliches Archiv, 130, pp.265-279.

[18]Zlatinov, D., 2018, Macroeconomic Challenges for the Transition to the Economy 4.0 in Bulgaria, The Scientific Papers of the University of National and World Economy, брой:3, 2018, pp.153-163.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

EVOLUTION OF THE DAIRY SECTOR OF THE REPUBLIC OF MOLDOVA: LATEST TRENDS AND DEVELOPMENTS

Anatolie IGNAT, Eugenia LUCASENCO

The National Institute for Economic Research, 45 Ion Creanga str., Chisinau, Republic of Moldova, Emails: anatolie.ignat@gmail.com, eugenia_lucasenco@yahoo.com

Corresponding author: anatolie.ignat@gmail.com

Abstract

The paper aims to analyze the evolution of the dairy sector of the Republic of Moldova, by presenting the latest trends in the sector and a wide analysis of the sector since 1990. Research has been carried out based on statistical data provided by the National Bureau of Statistics of the Republic of Moldova and data accessed from UN Comtrade database. The main analyzed indicators refer to number of dairy cows, milk production, imports and exports of dairy products. Therefore, the number of milking cows has diminished by about 3.6 times between 1990 and 2017, milk production declined by 3.4 times from 1,503 to 443 thousand tons in the same period, while the productivity, after a period of decline in 1990-1995, has stabilized between 1996 and 2004 and has started to rise since 2005. At the same time, the balance of foreign trade in dairy products is deeply negative for all categories of dairy products. Conclusions of the paper present a difficult situation in the dairy sector, with potential prospects of recovery as a result of paying a special attention to this sector by the governmental institutions.

Key words**:** *milk production, import, export, Republic of Moldova, dairy sector*

INTRODUCTION

The social and economic importance of the dairy sector is primarily due to the fact that it represents a source of high biological value food products, thus producing the most significant part of the milk production and about 10% of the volume of meat from the Republic of Moldova.
Cattle are also an efficient mean of transforming different crop resources and residues of the food industry into products with a superior biological value. At the same time, milk sales are an important source of income for many families in rural areas.

MATERIALS AND METHODS

For a better analysis of the evolution of the dairy sector of the Republic of Moldova, the following indicators have been used: number of cattle heads, number of cattle by categories of household, number of milking cows, milk production and consumption. The analyzed period covers the years 1990 – 2017. The data was provided by the National Bureau of Statistics of the Republic of Moldova, Ministry of Agriculture, Regional Development and Environment and UN Comtrade database.
Previous research concerning the dairy sector of the Republic of Moldova have been carried out by Stratan [9], Ignat [2], [3], Prohnitchi [8], Fedorciucova [1] and others.

RESULTS AND DISCUSSIONS

Cattle breeding in the Republic of Moldova had the highest degree of development during the period 1989-1990. During these years, the cattle herd reached the level of 1,112 thousand heads, including 402 thousand heads of cows. Therefore, in order to make a comparison with the above-mentioned period, in 2017 the total number of cattle was 164 thousand heads, of which 112 thousand cows [6]. Thus, only in the last ten years the cattle population has decreased by about 33 percent, including the cows for milk by about 43 percent (Figure 1).
Compared to the 90s, the way milk production is organized has also experienced fundamental changes. Thus, in 1990 about 1,150 dairy farms operated in Moldovan SSR and the largest part of the milking cows was grown at these farms [6].

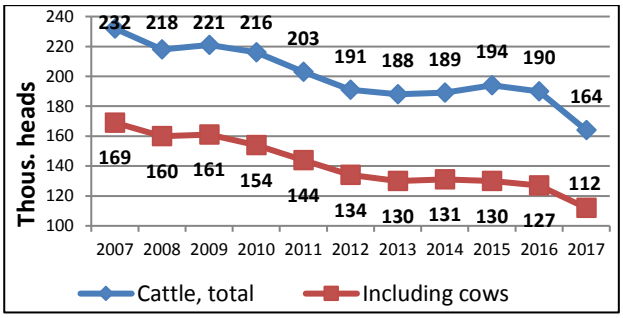


Fig. 1. Number of cattle, 2007-2017, thousands of heads
Source: elaborated by authors based on NBS data [6]

On 01.01.2018, according to MARDE data 120 commercial dairy farms were operating, with a total number of 10,168 milking cows, which represented only slightly more than 9% of the total number of milking cows [4]. Another 91% of the dairy cows were kept in households by individual animal keepers with an average of 1-2 cows.

The main breeds of bovine animals raised in the Republic of Moldova are those for milk and milk and meat such as Moldovan black spotted, Holshtein and Simmental.

At the same time, some positive trends are observed in the dynamics of the development of cattle farms. Thus, starting with 2014, despite the decrease in the total number of cattle, including cows, the number of animals in agricultural enterprises increased from 12.3 thousand in 2014 to 19.1 thousand in 2018 [5] or by about 55 percent (see Figure 2).

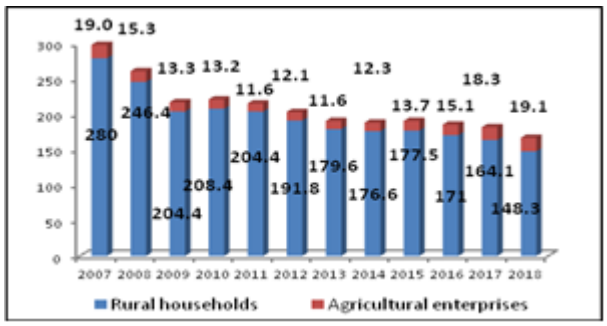


Fig. 2. Dynamics of cattle by household category, 2007-2018, thousand heads
Source: elaborated by authors based on NBS data [6]

Dynamics of milking cows herd follows broadly the same trends. Thus, the herd of milking cows kept in the agricultural enterprises after a short phase of growth in the years 2013-2016 has entered in a reduction phase since 2017, so that in 2018 the number of milking cows in these enterprises reached 5.4 thousands (Figure 3).

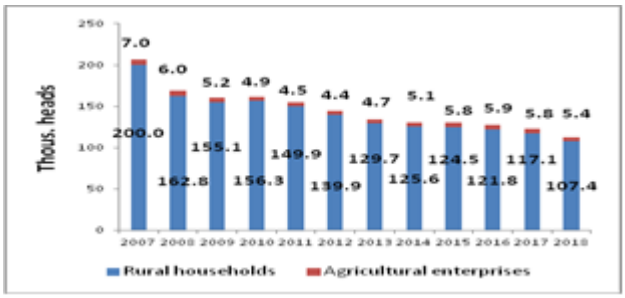


Fig. 3. Number of milking cows by types of households, 2007-2018, thousands of heads
Source: elaborated by authors based on NBS data [6]

The total cow milk production has been reduced from about 1,503 thousand tons in 1990 to about 443 thousand tons in 2017, or by more than three times. At the same time, the average annual milk production per cow after a decline in 1990-2000 has been steadily rising and is now close to the 1990s level (Table 1).

Table 1. Total cow milk production and average annual productivity, 1990-2017

Indicators	1990	1995	2000	2005	2010	2015	2016	2017
Total cow milk production, thous. tons	1,503	751	555	627	591	480	462	443
Average annual productivity (tons / cow)	3.7	2.0	2.0	2.7	3.7	3.7	3.6	3.6

Source: elaborated by authors based on NBS data [6]

The largest share of the milk production (around 95% in 2017) is provided by households. It should be noted that the volume of households' milk production is continuously decreasing from 576.4 thousand tons in 2010 to 418.4 thousand tons in 2017 or by 38%.

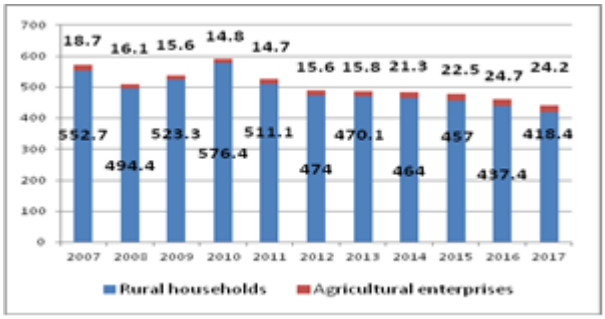


Fig. 4. Production of cow milk by types of households, 2007-2017, thousand tons
Source: elaborated by authors based on NBS data [6]

At the same time, milk production of agricultural enterprises after a period of growth in the years 2012-2016, signaled a decline in 2017 (Figure 4).

Concomitantly with decline of the number of milking cows and decrease of dairy production volume, the average productivity per cow has been steadily rising since 2000 in both, households and agricultural enterprises. Thus, the average annual productivity of agricultural enterprises in 2017 was about 4.2 tons, which is about by 5% above the level of 1990. At the same time, the average annual productivity of households increased from 3.0 tons in 1990 to 3.6 tons in 2017 or by around 21%. It is worth mentioning that in recent years, the average annual productivity in agricultural enterprises is higher than in households.

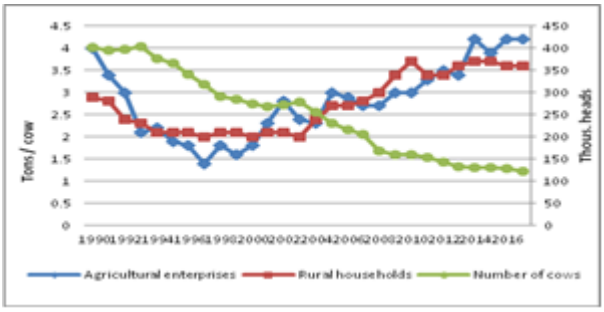


Fig. 5. Annual average milk productivity per types of households and the cattle herd, 1990-2017, tons / cow, heads

Source: elaborated by authors based on NBS data [6]

The rising productivity in recent years has somewhat amortized the reduction in milk production caused by the continuous decline of the milking cows herds since 1990 (Figure 5).

Households where most of the milking cows are currently kept, despite their high weight in the sector, cannot assure the right use of technologies necessary for cattle breeding, as they do not have enough possibilities to use necessary tools and technological equipment for the preparation and distribution of compound feed, mechanized milking and other cows' maintenance operations. Therefore, the milk produced in these farms is of unsatisfactory quality according to requirements of the processing enterprises. Another major deficiency of the households' milk production is the very pronounced seasonality, which leads to the overproduction of milk during spring and summer and a shortage of milk during the winter period. These fluctuations significantly affect the production process of the milk processing enterprises. A vulnerable point of milk production in households is the collection of milk and its transport as a raw material for milk processing enterprises. Livestock production in rural households also creates serious environmental pollution problems, including pollution of air and drinking water sources. At the same time, milk production in households represents an important source of income for a great part of the rural population. In this context, it is very important to stimulate investments in the creation of cattle farms near the villages, which will allow the use of modern technologies for maintenance, nutrition and exploitation of animals and thus significantly increase their productivity and obtain a competitive product on the domestic, as well as on export markets.

Purchase and processing of raw materials

Processing enterprises collect milk directly from farms, while milk produced in households is collected through collection points. Nowadays, 696 collection points are active, the majority of which belong to the processing enterprises, and 58 of them belong to other economic entities.

For milk collection points it is mandatory to implement hygiene requirements as well as HACCP preliminary programs, including traceability, endowment with laboratory equipment, including express tests for determination of antibiotics.

Milk purchase prices may range from 3.2 to 6.5 Moldovan lei per liter depending on the season, the processing enterprise and the collection point. Most of the milk is collected from March to September [4].

Many households sell milk and dairy products (sour cream, cow cheese, butter) obtained in homemade conditions on local agricultural markets. At the same time, milk processing enterprises lack the qualitative raw material. As a result, domestic milk production covers domestic consumption needs only at 83-90%

and in the last years there is a tendency of decreasing of the self-sufficiency level (Table 2).

Table 2. Milk consumption balance, 2009-2017, thous. tons, %

Elements of the balance	2009	2010	2011	2012	2013	2014	2015	2016	2017
Resources									
Production	575	591	560	525	527	525	520	504	485
Import	40	64	84	101	96	86	79	99	134
Stock variation	4	-13	-17	6	1	-9	9	4	-7
Total resources	**619**	**642**	**627**	**632**	**624**	**602**	**608**	**607**	**612**
Uses									
Export	14	14	18	13	17	21	27	50	33
Fodder	3	3	3	11	16	18	15	19	17
Loses									
Consumption of population	602	625	606	608	591	563	566	538	562
Total uses	**619**	**642**	**627**	**632**	**624**	**602**	**608**	**607**	**612**
Self-sufficiency level, %	95.0	94.1	92.0	84.7	86.8	90.4	89.5	90.5	83.8

Source: Source: elaborated by authors based on NBS data [7]

Nowadays, 29 milk processing enterprises hold a sanitary veterinary authorization, of which only 17 enterprises are operating.

The surplus of existing milk processing capacities and obsolete equipment generates considerable losses. As a result, the competitiveness of domestic dairy products both at the price and quality level is often below the level of import production.

At the same time, starting with 2009, already 6 dairy enterprises have implemented HACCP and another 5 enterprises have initiated the HACCP and ISO 22000 re-equipment and implementation procedures [4].

Table 3. Dairy production volume indices, 2008-2017, %, compared to the previous year

Product	2009	2010	2011	2012	2013	2014	2015	2016	2017
Milk and cream with fat content <6%, thous. tons	92.2	106.0	96.6	99.2	104.6	120.5	101.7	107.5	93.0
Milk and cream in solid form, tons	67.6	66.8	51.4	85.8	81.9	237.4	130.2	123.4	147.7
Butter, tons	88.0	109.9	92.4	97.1	110.5	112.4	102.4	122.6	81.3
Cheese and fat cheese, tons	52.0	135.9	117.3	101.2	115.2	99.7	101.7	97.3	119.4
Cured milk, creamy milk cream, yoghurt, kefir, cream and other fermented products, tons	102.2	104.7	106.6	100.0	110.6	104.4	103.5	100.3	95.0
Ice cream and other ice forms with or without cocoa, thousands of liters	93.0	117.1	99.1	113.6	107.8	103.1	102.1	103.2	103.0

Source: Source: elaborated by authors based on NBS data [6]

Dairy production volumes registered stable increases over the period 2013-2017 for most types of product. Production volumes increased significantly for "Milk and cream in solid form", "Butter" and "Cheese and fatty cheese" (Table 3). This phenomenon seems very interesting in the context of the continuous reduction of the volume of milk produced in the Republic of Moldova (Figure 4) and the high consumption of milk in dairy processing industry, so for the production of one kilogram of butter, about 22 liters of milk is used.

Exports and imports of dairy products

The volume of exports of dairy products from the Republic of Moldova registered a steady increase of about 2.4 times during the period 2013-2017.

During the same period, dairy imports increased by 2.1 times. The largest increases in import volumes were recorded for products of group 0401 "Milk and cream, not concentrated, nor containing added sugar or other sweetening matter" and group 0405 "Butter, including dehydrated butter and other fats derived from milk". The largest increases in dairy exports were recorded for products of group 0402 "Milk and cream, concentrated or containing added sugar or other sweeteners" and group 0406 "Cheeses and curd". At the same time, the balance of foreign trade of dairy products during this period was deeply negative, with the exception of the export of butter in the years 2015-2016. Being calculated in natural indicators, dairy imports

have exceeded exports by about 12 times in 2017 (Table 4).

Table 4. Export and import of dairy products, 2013-2017, tons, %

	2013	2014	2015	2016	2017	2017/2013, %
Products from group 0401						
Export	0	19	0	0	0	--
Import	5,398	9,005	6,182	14,170	23,397	433.4
Balance	-5,398	-8,986	-6,182	-14,170	-23,397	433.4
Products from group 0402						
Export	40	243	291	1,185	1,362	3,405,0
Import	2,947	2,861	2,598	2,879	2,250	76.3
Balance	-2,907	-2,618	-2,307	-1,694	-888	30.5
Products from group 0403						
Export	0	19	0	0	0	--
Import	4,379	3,988	4,348	4,675	5,218	119.2
Balance	-4,379	-3,969	-4,348	-4,675	-5,218	119.2
Products from group 0404						
Export	0	0	0	0	0	--
Import	434	514	530	406	784	180.6
Balance	-434	-514	-530	-406	-784	180.6
Products from group 0405						
Export	475	401	747	1597	542	114.1
Import	709	418	420	661	1626	229.3
Balance	-234	-17	327	936	-1084	463.2
Products from group 0406						
Export	773	877	1,050	999	1246	161.2
Import	3,795	3,343	3,167	3,693	3,900	102.8
Balance	-3,022	-2,466	-2,117	-2,694	-2,654	87.8
Total dairy products						
Export	1,288	1,559	2,088	3,781	3,150	244.6
Import	17,662	20,129	17,245	26,484	37,175	210.5
Balance	-16,374	-18,570	-15,157	-22,703	-34,025	207.8

Source: elaborated by authors based on UN Comtrade data [10].

Table 5. SWOT analysis of the dairy sector of the Republic of Moldova

Strengths
-The process of harmonizing the legal and normative framework in the field of milk production and processing has been initiated; -Favourable conditions for the cultivation of fodder crops needed for the growth of cattle; -Existing export of dairy products to CIS countries; -Human potential with experience in the field of milk production and processing
Weaknesses`
-95% of milk production comes from the individual sector -Insufficient production of qualitative milk -Only about 3% of the cow herds are of a certain breed -Low quality of feed -Lack of extension services in the milk production and processing sector -Lack of information necessary for business development in the dairy sector -Lack of innovation in the milk production and processing sector -Outdated technologies in the milk production and processing sector -Low competitiveness of the domestic dairy products -Lack of skilled labour force in the milk production and processing sector -Underused capacities in the milk processing sector -Limited subsidization of the milk production sector -The massive import of cheap dairy products from Ukraine and other countries -Significant seasonality feature of the of milk production -Lack of adequate marketing strategies at the sector level -Difficulties in accessing financial funds -Inefficient management of the artificial sowing system -Educational programs do not meet the needs of the sector -Lack of a national project to finance the development of the sector -Insufficient efforts to promote dairy exports to EU countries
Opportunities
-Increase of milk production to ensure internal consumption -Increasing exports to traditional markets and development of new markets, particularly those in the EU (diversification of export markets) -Development of traditional and regional products (diversification of products) -Replacing the dairy imports -Intensify the efforts of development of family milk farms (up to 50 heads). Development of clusters, production and marketing groups, and other forms of association
Threats
-Adverse climatic phenomena -Possibility of regional epizootic phenomena -Unfair competition from neighboring countries -Demographic processes that to the decrease in consumption

Source: elaborated by authors.

Milk represents a strategic food product due to its nutritional components. Development of the milk production can contribute to the alleviation of a range of problems such as: reduction of imports, ensuring food safety and security, increasing on–farm productivity, raising on-farm incomes, reducing post-harvest losses, ensuring fair prices for

agricultural commodities and quality milk products.

Despite the precarious situation in the dairy sector that can be observed from a long list of weaknesses mentioned in the SWOT analysis certain opportunities exist in order to solve at least partially some of the major problems faced by this sector.

A package of well targeted policies is necessary to be elaborated and urgently implemented in order to overcome existing problems of the dairy sector in the Republic of Moldova.

CONCLUSIONS

The number of milking cows has diminished by about 3.6 times between 1990 and 2017, from 402 to 112 thousand heads and this process is steadily declining.

About 91% of milking cows are kept in households with an average of 1-2 cows and only 9% of this herd is grown within agricultural enterprises.

Milk production declined by 3.4 times from 1503 to 443 thousand tons in the same period, and this process is also steadily declining. At the same time, milk production in agricultural enterprises has been increasing since 2012.

Productivity, after a period of decline in 1990-1995, has stabilized between 1996 and 2004 and has started to rise since 2005, thus exceeding nowadays the level from 1990.

Domestic milk production covers domestic consumption needs at only 83-90% and in the last years there is a tendency of decreasing the self-sufficiency level.

Dairy production registered stable increases during the period 2013-2017 for most types of products, despite the continuous decrease of the volume of milk produced in the Republic of Moldova.

The balance of foreign trade in dairy products is deeply negative for all categories of dairy products, with the exception of butter exports in the years 2015-2016. In 2017, imports of dairy products calculated by natural indicators exceeded exports by about 12 times.

REFERENCES

[1]Fedorciucova, S., Calmas, V., Damaschin, M., 2017, Situația actuală privind producerea, comercializarea și asigurarea calității produselor lactate în Republica Moldova (Actual situation regarding producing, commercialization and quality assurance of dairy products in the Republic of Moldova). Journal of Research on Trade, Management, and economic Development, Volume 4, issue 2(8), p. 67 – 79.

[2]Ignat, A., 2013, Rolul instituțiilor în dezvoltarea sectorului de producție a laptelui (The role of the institutions in the development of milk producing sector). Analele Institutului de Economie, Finanțe și Statistică (Annals of the Institute of Economy, Finance and Statistics) Ediția a III-a. (3rd Ed) p. 66 – 68.

[3]Ignat, A., Ghițiu, L., 2012, Exportul și importul produselor lactate în țările Uniunii Europene (Export and import of dairy products in the European Countries), Economie și Sociologie (Economy and Sociology), no. 1, IEFS, Chisinau.

[4]MARDE, 2018, Information provided by the Ministry of Agriculture, Regional Development and Environment of the Republic of Moldova, Chisinau, Unpublished.

[5]NBS, 2018, Anuarul Statistic al Republicii Moldova 2018. Chişinău (Statistical Yearbook of the Republic of Moldova), 2018, Chisinau.

[6]NBS, 2017, Statbank database. http://statbank.statistica.md/pxweb/pxweb/ro/40%20Statistica%20economica/?rxid=b2ff27d7-0b96-43c9-934b-42e1a2a9a774, Accessed on: 05.12.2018

[7]NBS, 2018, Official web page. http://www.statistica.md/category.php?l=ro&idc=129& Accessed on: 06.12.2018

[8]Prohnitchi, V., 2017, Moldovan dairy: the difficult way towards the EU market. https://www.expert-grup.org/media/k2/attachments/Studiu_industria_lactatelor.pdf, Accessed on: 22.11.2018.

[9]Stratan, A., Ignat, A., Aculai, E., 2011, Perspectivele dezvoltării sectorului de lactate în Republica Moldova (Perspectives of the development of the dairy sector in the Republic of Moldova). The Research Institute for Agriculture Economy and Rural Development. International Symposium. Agrarian Economy and Rural Development: Realities and Perspectives for Romania. Proceedings. Bucharest, p. 216 – 221

[10]UN Comtrade, 2018, http://comtrade.un.org/, Accessed on: 12.12.2018.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE HUMAN RESOURCES RECRUITMENT AND SELECTION IN THE PUBLIC INSTITUTIONS AND SMEs - A CASE STUDY IN CALARASI AND IALOMITA COUNTIES OF ROMANIA

Andrei Radu IOVA, Daniela CREȚU, Mariana NĂSTASE

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania, Emails: andrei_anglia@yahoo.com, danielacretu5@yahoo.com

Corresponding author: andrei_anglia@yahoo.com

Abstract

The present paper addresses some of the most important themes of human resources management (recruitment and selection) from the perspective of employers from the public and private sector, from Ialomiţa and Călăraşi counties. Our study aims at identifying the most important recruitment criteria for executive staff and decision makers used at the level of the Romanian organizations as well as the differences in the methods of selection of executive staff and decision makers used by the Romanian, public and private organizations . In this regard, we used the interview and questionnaire survey with closed questions, applied to a number of 157 SMEs and 107 public institutions. Public institutions show a number of differences compared to SMEs, and the situation is also influenced by the labour legislation. In the public institutions, a major role in the final decision on employment is held by the education, compared to the situation at the level of SMEs, where the experience is of the highest importance in the final decision to employ a person, being dominant compared to the "education" criterion.

Key words**:** *SME, public institutions, recruitment, human resources, selection*

INTRODUCTION

One of the most important elements of the human resources policy is the recruitment process. Through recruitment, the workforce in an organization can be improved, or the average level of professional competence can be improved or adjusted.

Considering the idea that the organizational decisions, economic and social progress depend to a large extent on the quality of all activities taking place, it is understandable also the special attention given by some specialists to understand the characteristics of this process by a number of specialists in the human resource field.

Recruitment is the first part of the employment process of a vacant job and includes the careful examination of the job and its requirements, in order to be able to identify the adequate source of the candidates and how they can be attracted to apply for a job" (Cindrea, I., 2008) [2].

In another vision, "*staff recruitment represents the activity organised by an enterprise to attract the unemployed human resources, in order to satisfy the workforce need in the respective period - action prior to conclude the employment contract and which implies responsibilities from the enterprise*". (Panişoara, I ., 2005) [7].

As regards our country is concerned, the staff recruitment is done to the greatest extent according to the techniques already known, using less the existing practices worldwide. Most companies face today the unstable social economic climate, few jobs are available, and no adequate recruitment technique is available for those available. (Ogarcă, R. F., 2014) [6].

The human resources recruitment has become, in the current social economic context, a very complex issue.

Also, as labour market competition becomes more and more fierce, the difficulty of finding those persons who meet the increasingly demanding conditions imposed by the organizations turned into a real challenge for the companies (Brown and Harvey, 2006) [1].

Recruitment is the first step or first stage in the staff process, as well as the first step in the selection process. Although the traditional staff is more selective, the staff recruitment is

a priority, as a selection of efficient staff can only be achieved if the recruitment process ensures a sufficient number of competitive candidates.

In other words, *the objective of staff recruitment is to identify a sufficiently large number of candidates, so that those who meet the conditions can be selected*. (Ogarcă, R. F., 2014) [6]

The staff selection is the next step, consisting in the evaluation, by various methods, of the candidates and the choice of the most suitable for the post, followed by the employment. The selection follows logically the recruitment process. (Dumitru and Ignătescu, 2013) [3].

Recruitment and selection have a high share in human resources management, the result of which depends on the quality of the organization staff.

The first condition of a company success is to attract and retain the best specialists in the sector where it competes.

To this end, a working climate must be created in which each employee can show his talent and be appreciated. The times when the boss was always right, and the subordinates did what they were asked have passed. The valuable employees no longer want only material rewards, but also professional fulfilment through interesting, useful and important work in an organization they are proud of, with leaders they appreciate and inspire respect. This explains the remarkable results in companies where the employees are encouraged to come up with their own ideas. (Grecu and Raboaca, 2006) [4].

MATERIALS AND METHODS

The quantitative field research was carried out during 2018, based on an interview and questionnaire, applied face to face, at the headquarters of the organizations that agreed to be part of the investigated sample.

The interview was based on a list of predefined questions, 5 situational questions, with open response, which allowed the interviewee freedom of expression. Their motivation was to find out the recruitment criteria and the selection methods used within those organizations.

As a data collection technique, we used the interview and questionnaire survey with closed questions, applied to 157 SMEs and 107 public institutions in Călăraşi and Ialomiţa counties.

The questionnaire included aspects of the recruitment criteria for candidates, with 11 closed items as well as the selection methods for candidates with 8 closed items. For the purpose of data processing, the scores method was used, with scales ranging from 1 to 5 (Note: 1- *very important, 2-important, 3-indifferent, 4-little important, 5-not important*) for the first set of items and a scale of 1 to 3 (Note: 1- *always, 2 frequently, 3-sometimes*) for the second set, respectively, the importance of the selection methods of the candidates. Concerning the interview, the discussions took place with the managers of the organizations and/or the human resources managers and focused on the following: the sources and methods of the recruitment methods used, the content and structure of the employment interview, the tests used for the selection of the human resources, the stages of the organization until the decision for employment is made, the structure and composition of the recruitment and selection committee.

RESULTS AND DISCUSSIONS

The responsibility of any organization derives from the purpose of its activity. In order to achieve this goal (end user satisfaction) or even just to survive, it must take care of the following desires: (Marinas and Manolescu, 2006) [5].

a) first of all, it must ensure the identification of the candidates skills and qualities in order to be able to choose those who best meet the requirements of the job;

b) must ensure the use of the most appropriate recruitment methods to identify the most competitive candidates;

c) throughout this time, it must ensure the compliance with the legislation regarding

giving equal opportunities to the candidates without resorting to discriminatory practices.

The success of the recruitment process depends largely on solving such problems successfully. The employees recruitment becomes a costly, independent and complex activity, both through the great work it attracts and the importance it has for the entire organization.

Of the 4,563 existing enterprises in Călăraşi county and 4,175 existing in Ialomiţa county, only 1,136 (594 in Călăraşi and 542 in Ialomiţa) are in the SME category, respectively 13%. Among these, 157 (83 of Călăraşi and 74 from Ialomiţa) and 13.8% were included in the investigated sample. (Figure 1). Regarding the activity field of SMEs in the sample, large enterprises are active in the agricultural and agri-food sectors, the sugar and oil industry, non-ferrous metals, clothing. Small-sized SMEs are active in the agricultural, construction, services, metallic, and commerce sectors.

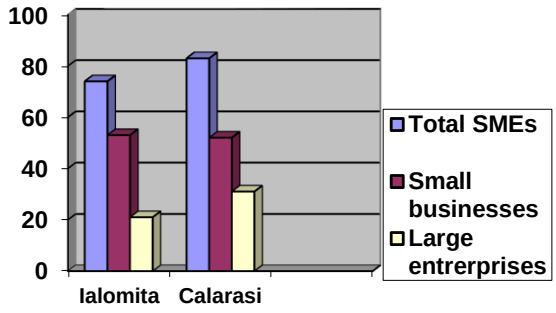


Fig. 1. Structure of SMEs contained in the investigated sample

Source: Own design.

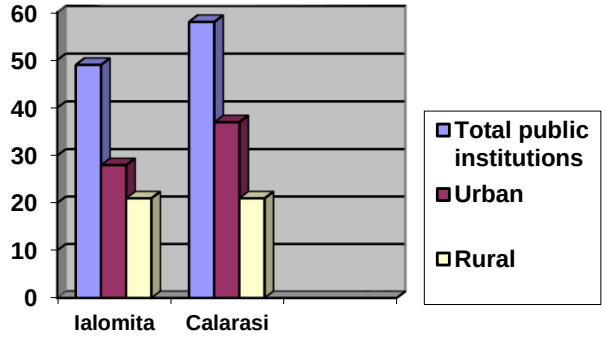


Fig. 2. Structure on areas of the public institutions contained in the investigated sample

Source: Own design.

In the category of the 107 public institutions contained in the sample, there are education institutions, social assistance, town halls, commune medical cabinets etc, in the rural and urban areas of the two counties (Figure 2.).

In order to establish the staff recruitment criteria, the interviewees were asked to evaluate the following statements, according to a scale of 1 to 5 (*Note: 1- very important, 2-important, 3-indifferent, 4- little important, 5-not important*)

The most important four human resources recruitment criteria used by the analyzed organizations are the following: Individual qualities, skills and aptitudes of candidates (2.05), studies (2.17), professional knowledge (2.32) and experience (2.46) (Table 1). This hierarchy of selection criteria means that, when they want to hire new employees, the organizations are considering several criteria according to which future employees are to be selected.

Table 1. Candidates recruitment criteria

Criteria	Score/ organizations		
	SMEs	Public institutions	Average score
Individual skills, aptitudes and qualities	1.86	2.24	2.05
Studies	2.56	1.78	2.17
Professional knowledge	2.44	2.20	2.32
Experience in the field	2.06	2.86	2.46
Recommendations	2.68	2.96	2.82
Age	3.00	3.86	3.43
Physical appearance	3.20	3.98	3.59
Personal relationships	3.16	4.10	3.63
Gender	3.34	4.16	3.75
Nationality	3.56	4.28	3.92
Sign	4.16	4.86	4.51

Source: Own processing.

Note:1- very important; 2-important; 3 –indifferent; 4- little important; 5- not important

The criterion of **individual qualities, skills and aptitudes** is used with a very high frequency in the selection process of the future employees, especially at the level of

SMEs, and in the public institutions this criterion is less important.

In the medium-sized enterprises, the higher the number of employees is, the more important this criterion is, the average score being 1.53.

Studies are an important criterion according to which the employees are recruited and selected at the level of the organizations in Romania, except for the public institutions where this criterion holds the highest share in the final decision for employment. Such a situation is also justified by the legislation on the employment of civil servants and employees in the public institutions, generally being the main criterion for the human resources recruitment and selection. The gap between the two categories of organizations is quite high on this criterion, of 0.78 in the favour of the public institutions, which consider this criterion important and very important.

The expertise in the field, validated through the professional knowledge, is another important criterion considered by the employers. In this regard, the two categories of organizations consider public institutions to be more important than SMEs, which tends to take into account the candidate's experience before professional knowledge (2.06 points for experience and 2.44 pts for professional knowledge). In the public institutions, the situation is reversed, in the sense that the experience in the field is surpassed by the professional knowledge with 0.66 pts.

Both categories of organizations are interested in the candidates recommendations of other jobs, while criteria such as age, physical appearance, gender, nationality, and the sign are very little taken into account in the candidates recruitment and selection.

The general manager and/or the human resources specialist were present at the interview. Most said that among the questions asked to the candidates can be listed: What can you tell us about you?; Why did you give up your last job? What do you expect from this job?; Can you work with fixed time, pressure, etc. ?; What were the responsibilities at the last job? How long will you stay with us ?; Why qualities do you think are needed for this job?; Describe the ideal work environment!, why did you choose a career in ...?

Largely considered, the selection is made in two important moments, namely: the selection of the candidates for entering a form of vocational training, the selection of a candidate for a particular post/position within a particular organization, after the individual already has some professional training. (Văcărescu and Hobeanu, 2013) [8].

The selection exam requires an analysis of the compatibility between the requirements of the positions or professions and the skills and the individual particularities of the candidates.

The methods and techniques of the human resources selection allow the staff analysis in order to achieve efficiently their objectives, tasks, competences within the organisation. (Verboncu I., 2011) [9].

On the basis of the selection process there are a number of methods and techniques each designed and used in a differentiated way depending on the nature of the positions for which the selection is carried out, the nature of the skills, the skills or the behaviours of the tested persons.

Of the many methods used in the human resources practice, in SMEs and public institutions, the most used are the following:

(i)The background information provided by writing and presenting your CV and letter of motivation. From the statistical analysis, it is estimated that a large number of candidates are eliminated at this stage, especially in the selection made by the public institutions. Particularly in the public institutions, it is estimated that a candidate must assume responsibility for the very detailed writing of the CV, making a clear analysis of the achievements and proposed objectives. Less attention is given to small enterprises candidates' CV and the interest increases in a well-written CV in medium-sized enterprises.

(ii) The subsequent stage of CV and letter of motivation submission is the completion of the application files. They offer the selection committee the possibility to form the candidate's profile as accurately as possible,

and in particular to determine the extent to which it meets the requirements of the vacancy. And at this stage, the public institutions are more involved than SMEs.

(iii)Both categories of organizations mentioned that they use the candidates' selection process and tests to get to know and analyze the candidates psychological profile. If several types of tests are used in the public institutions: evaluation of knowledge, skills, personality, etc., medium-sized enterprises generally use only one test that includes skills and personality issues besides those related to knowledge in the field, and in small businesses only the professional test is used.

The selection interview is the most frequently used and at the same times the most controversial selection method.

In order to establish the candidates selection methods, the interviewees were asked to evaluate the following statements, according to a scale from 1 to 3 (Note:1- always; 2 frequently; 3 – sometimes).(Table 2.).

Table 2. Methods of candidates selection on staff categories

Selection methods	Score/staff categories		
	Executive	Management	Average score
CV and letter of intent	1.36	1.28	1.32
Classical interview	1.26	1.00	1.13
Competences based interview	1.26	2.24	1.75
Skills test	2.28	1.56	1.42
Knowledge evaluation test	1.86	2.24	2.05
Personality test	2.24	1.28	1.76
Practical test	1.96	2.78	2.37
Simulation	2.54	1.86	2.20

Source: Own processing.

Note:1- always; 2 frequently; 3 – sometimes

As regards **the selection methods** used at the level of the organizations in the investigated sample, there are a number of differences, by categories of employees. Thus, for employing the execution posts, the classical interview, the CV and the letter of intent are the main selection methods of the candidates for both the executive and the executive positions, with an average score of 1.13 pts for the interview and 1.32 points for CV and letter of intent.

The differences in the methods of selection of executives are even more obvious in types of organizations.

Thus, at the level of SMEs, the tendency recorded at the general level, the CV and the letter of intent and the classical interview, plus the practical test are the main methods used in the selection process of the executive staff. The public institutions show a number of differences compared to SMEs, the main tools used in the process of hiring executives such as CV and letter of intent, interview, and knowledge tests. Regarding the selection of staff for management positions, both types of organizations take the classic interview, followed by a personality and aptitude test that has the same value as the CV and the letter of intent in the hierarchy of the criteria respectively 1.28 Such a situation is also influenced by labour legislation, which regulates work relations in the public sector, and which provides candidates with an employment test consisting of a written test and an oral test.

Regarding the selection of staff for management positions, both types of organizations take the classic interview, followed by a personality and aptitude test that has the same value as the CV and the letter of intent in the hierarchy of the criteria respectively 1.28 pts. It should be mentioned that in the public institutions, for the selection of candidates for a management position, emphasis is also on simulation, namely, the creation of circumstantial situations in which the management staff must make a decision.

CONCLUSIONS

Recruitment is a Human Resource Management activity that seeks and finds candidates for the organization vacancies so that it can select the most appropriate individuals to meet the needs of the organization while minimizing related costs. Following the recruitment process, the human

resources selection consists in selecting, according to certain criteria, the most suitable candidate to have a position within an organization

Analyzing the existing situation in Ialomița and Călărași counties regarding the process of human resources recruitment and selection, the following specific aspects may be retained in the form of conclusions: the short-term evolution of the activity is the main method of determining the necessary human resources especially in SMEs; the main criteria used in human resources recruitment are: individual knowledge, skills and aptitudes, studies, professional knowledge and experience in the field.

However, SMEs are at risk of developing and promoting the relatives; the experience has the greatest importance in the final decision to employ a person, being dominant compared to the "studies" criterion; in the public institutions, studies have a major role in the final decision on employment, compared to the situation of all SMEs; the relation between the external sources of recruitment and the internal ones is over-unitary, the employment strategy being aimed at attracting potential candidates in the external area of the organization; the job advertisements published inside the company are the main method of recruitment from internal sources of executive and management staff; the lists of former employees are rarely used to fill vacant posts; The Internet, job advertisements published in the press, and the recommendations are the most commonly used external recruitment methods for both executive and management staff; neither public institutions nor SMEs turn to the services of specialized human resource recruitment firms; the lack of partnerships between the business sector and the education institutions and the low level of qualification of most of the job seekers, which are in the database of the National Agency for Workforce Employment are the main causes for which the recruitment of young graduates directly from the education institutions and the offer of the National Agency for Workforce Employment to be external recruitment methods with a very low frequency; the preponderantly theoretical training of the graduates of the education institutions and the lack of practical skills are also reasons why the organizations rarely go to recruitment from the education institutions to fill the executive and management positions; CV and letters of intent, classical interview, knowledge evaluation test and practice test are the most commonly used selection methods for the executives and for the managers - CV, classical interview, personality and aptitude tests, simulations are the selection methods with the highest frequency of use in the process of selecting managers over the interview and knowledge test or practice test that are used frequently or sometimes, but to a lesser extent than other selection methods.

REFERENCES

[1]Brown, R. D., Harvey, D., 2006, An experiential approach to organization development**,** 7th Ed., Prentice Hall Publishing, USA, pp.134.

[2]Cindrea, I., 2008, Human resources management, Publishing Univ. "Lucian Blaga" Sibiu, pp. 42.

[3]Dumitru, M., Ignătescu, C., 2013, Business law. Legal report of business law. Contract. Hamangiul Publishing, Bucharest, pp. 83.

[4]Grecu, I., Raboaca, G., 2006, Improvement of human resources management in the company, The Economic Publishing, Bucharest: A.S.E., 2006, pp.67.

[5]Marinaș, C., Manolescu, A., 2006, Compared human resources management, A.S.E. Publishing, Bucharest, 2006, pp.28.

[6]Ogarcă, R. F., 2014, SMEs management – Manual for distance learning, Craiova, pp. 57-58.

[7]Panișoara, I., 2005, Human resources management, Polirom Publishing, Iași, pp.156.

[8]Văcărescu, L., Hobeanu, T., 2013, Management. Bases of organization management, 3rd revised and added edition, Sitech Publishing, Craiova, pp. 19

[9]Verboncu, I., 2011, How we lead?- methodological guide for managers, Technical Publishing, Bucharest, pp.106.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

RURAL AND AGRICULTURAL TOURISM IN BULGARIA – OPPORTUNITIES FOR A BETTER LIFE

Ivan KILIMPEROV

Agricultural University - Plovdiv, 12 Mendeleev Blvd., 4000 Plovdiv, Bulgaria, Email: i.kilimperov@gmail.com

Corresponding author: i.kilimperov@gmail.com

Abstract

Typical of the modern urbanized society is to have increased dynamics of life and the continued impact of various stress factors. Urban living conditions are constantly deteriorating – increased noise levels, air pollutants, lack of green areas, and so on. The quality of the food is also deteriorating. In this regard, the purpose of the study is to present the rural and agrarian tourism in Bulgaria as forms of tourism, meeting the modern needs of the urban ty type of person for a better life - clean environment, quality (and functional) food, happiness and human communication.

Key words**:** *tourism, rural tourism, happiness, functional foods, better life*

INTRODUCTION

The opportunities to explore the lifestyle of local people (their culture, traditions, holidays, etc.), the agriculture as a major economic activity in rural areas, the food and non food products traditional for the region, as well as the typical dishes, drinks and architecture lie at the heart of rural and agricultural tourism.

Both, humanity and human interaction, which embody the satisfaction of human social needs (third level in Abraham Maslow's Pyramid of needs), are deeply seated in the philosophy of rural tourism product. Rural and agricultural tourism offer a high level of diversity from everyday life, which, in itself, is a factor for overcoming the adverse effects of stress factors and forms of distress. All this - in combination with good food (of good taste, ecological and health characteristics) and pleasant atmosphere - leads to increased mood and self-esteem. Therefore, both rural tourism and agricultural tourism could also be perceived as factors of happiness and better life. However, to interpret them as factors of happiness and opportunity for a better life, we need to carry out a comparative analysis of the opportunities of rural tourism product to provide the key factors that have a positive effect on the mood of people.

Such opportunities are offered by the rural tourism accommodation, home-made food, food products produced in the country house or farm, production of functional food, organic farming and its products, communication in an informal environment with the hosts, family atmosphere in the tourist facilities, rural culture and holidays (as an element of the rural tourism product), as well as the active participation of the guests in all these processes.

A comprehensive vision for the development of the relevant rural tourism destination is also needed, including „…the preservation of the cultural heritage, promotion of tourist attractions, investments, diversification of activities, service and staff quality" [5]. In any case, "... tourist services in the rural areas are able to support local population and communities in developing economic diversity" [6].

All this leads to the idea of achieving sustainable development, based "on the understanding of the need to extend the current level of knowledge by carrying out more faithful studies in" [3] rural areas.

MATERIALS AND METHODS

For the purpose of the study, the main factors influencing human happiness were derived. Also an attempt was made to present these

factors as part of the elements of the rural tourism product.

Based on the tourist zoning of Bulgaria and the analysis of the above-mentioned factors, the basic areas that have opportunities to include these factors of happiness in the product of rural and agricultural tourism were also derived (the Case study method).

In the marketing strategy for development and advertising of rural tourism product, it should be included and the concept for promotion of rural and agricultural tourism in Bulgaria as an opportunity for a better life. The basic idea includes the possibility of offering a combined tourist service, including elements of different types of specialized tourism such as Spa and Wellness tourism, rural tourism, agricultural tourism, ecotourism, cultural and other types of tourism [1].

RESULTS AND DISCUSSIONS

Happiness can be defined as a particular state of mind and body. It depends on a number of factors – the mental and physical condition, the way of thinking, the people around us, the food we eat, the income, the time, etc. And although researchers at the University College of London recently discovered the formula of happiness, it cannot be triggered "on demand" or just "appear" taking into account the factors mentioned in the formula. Happiness is a strictly individual understanding and state of mind for each individual.

On the other hand, the main goal of the tourism industry is to satisfy certain needs and target interests of its users, so that they feel satisfied with the holiday. Therefore, similar to the concept of 'Wellness', happiness as an element of the tourism product should be present everywhere and each user should define it for themselves, according to their individual needs, life concepts, values, current state of mind and body.

However, if we consider happiness as a tourist concept, we should "subject" it to a tourist interpretation which aim is to form a core group of factors that push human mind towards more optimism, self-esteem, joy of life, self-confidence – i.e. factors that create conditions to increase the happiness in tourists.

In this regard, we may decompose Abraham Maslow's idea of human needs and bring out those which are more spiritual-philosophical and not so tangible: security, social belonging, friendship, self-realization.

In the end, on the basis of various studies, the following 8 factors influencing human happiness can be summarized [7]:

(i)Maintaining active social contacts.

A number of studies have indicated that people with active social contacts are more positively predisposed, healthier and happier. What is essential is not just maintaining social contacts, but surrounding oneself with people who can be relied on, i.e. a friendly circle (third level of Maslow's Pyramid).

(ii)Availability of more free time.

Although 'free time' is increasingly regarded as an abstract concept which is in direct dependence on income and working hours, in the end, each person can plan in their own time-budget enough free time. The 'free time' concept should also be clarified here. In general, this is the time that an individual should devote to themselves, to do the things they like and love; a time for spiritual growth. And although free time depends directly on working hours and income, ultimately, everyone should be their own master and freely dispose of their time, abilities and energy.

Therefore, each individual should feel free to schedule and allocate their own free-time fund according to their own individual needs. And, the more free time we have, the happier we should feel (based on the definitions of free time).

(iii)**Enough financial resources.**

Although money is not a measure of happiness, it is a necessary and important precondition if we want to devote ourselves to our loved ones and our hobbies. Happiness is also in direct contact with the satisfaction of the primary needs.

From the tourism point of view, the undertaking of the tourist trip is also linked to the availability of sufficient financial resources. Therefore, usually tourist trips are

undertaken by people with incomes at or above the national average.

(iv)**Slowing down.**

In modern times, we live our lives in an extremely dynamic and hectic environment. This, to a large extent, prevents us to 'see' and enjoy (or at least not enough) those moments that make us really happy – moments with our children while they grow up, the morning smile of the loved one, the quality food, etc.

(v)**Good deeds.**

Doing good is also contained in religions (incl. the religious-philosophical trends), we follow – Christianity, Islam, Judaism, Hinduism, Buddhism, etc., it is indeed the righteous social behavior that makes us human, it makes us better and happier.

(vi)**Physical activity.**

It has been proven that physical activity is one of the ways to overcome the adverse effects of modern lifestyle and the impact of stressful factors in our everyday life. On the other hand – overcoming the accumulated neuro-psychological tension increases the positivity in us and makes us more relaxed and happy.

(vii)**Amusement.**

Amusement is a synonymous to happiness. People who have fun more often, feel happier. Probably, it is due to the fact that they relieve the pressure in this way, or because of the diversity, or the opportunities for social contacts, time with loved ones, etc.

(viii)**More time with friends.**

Friends are among the most valuable 'gifts' we can get. A time spent with friends is fun; it leads to a slowdown, relaxation from problems, and it is sometimes related to doing good deeds.

According to other sources [8], to be happy it is important to surround ourselves with happy people, to smile more, to improve some of our skills, etc.

It is intrinsic to our very biological essence to live amongst nature, to be surrounded by our natural habitat – the biosphere. Therefore, the immediate contact with nature can be determined as an **important factor of happiness**.

From the point of view of tourism there is another thing of significant social importance for the tourists' happiness - the **form** under which basic services are offered, i.e. services related to the satisfaction of physiological needs - quality and ecological characteristics of food, specificity and specialization in offering the "accommodation" service.

All of the above factors of happiness can be considered as elements of the rural tourism product as well. ***Social contacts and human interaction*** is a sought-after service by rural tourists, especially by the narrowest form of rural tourism, where the opportunity to explore and experience the life of the local population lies in the core of tourism product.

On the other hand – human interaction, indeed, gives uniqueness to rural tourism product; it is an opportunity for the hosts to get to know their guests and to offer a high-quality tourist service.

Free time is associated with tourism in general. Free time is what lies at the heart of the development of the tourism business. Proper organization and management of rural guests' free time is the basis for increasing the satisfaction from the holiday as well as the positive thinking in tourists.

Offering more opportunities to explore rural culture and identity, transforming village festivals into tourist attractions with an opportunity for direct participation of tourists in them, will eventually lead to spiritual growth and increase of happiness.

Undoubtedly, the availability of sufficient ***financial means*** is one of the mandatory conditions to undertake tourism trips. Considering the conditions in Bulgaria, usually rural tourism is associated with lower prices of services offered in comparison to other forms of specialized tourism. In most of the cases the price-quality ratio is good and meets the consumers' expectations.

The **slow food** concept is in direct connection with the development of the catering service in rural and agricultural tourism. The main idea is to oppose to the globalization of bad eating habits, the great number of fast food establishments and the consumption of junk food.

There is one more thing laid down in the philosophy of rural tourism product - the opportunity to experience the simpler way of life, where **the pace is significantly lower**, where importance is given to little things that make us feel happy.

Often, rural tourism is considered together with ecotourism, as a sustainable form of tourism, aimed at preserving nature, traditions and customs, taking into account the needs of the local population. On the other hand – the life of local people is strongly linked to land and nature, and what is typical to rural environment is the high level of morality and humanism. This is a prerequisite for a high level of interaction and mutual assistance in the society, development of social and volunteering activities as part of the development of rural and agricultural tourism. In many cases, some of the elements of agricultural animation are even linked to the performance of good deeds by tourists – for example, planting a tree, afforestation of certain areas, initiatives to preserve nature and socio-cultural environment, etc.

The main element of the services in rural and agricultural tourism is the **physical activity** of tourists. It has been proven that farming is one of the most powerful anti-stress factors for a number of reasons: it is associated with consumption of a lot of physical power and energy, it offers a high level of diversity from everyday life; it provides immediate contact with nature.

Typical for the services of rural and agricultural tourism is that **animation** should "penetrate" everywhere – in the furnishing of the room, during meals, during diversification activities. A feature of rural tourism is the possibility for guests to take direct part in the "production" of the offered services. There is a '**fun**' element in the preparation of traditional for the region dishes, in the supply of the necessary products (produced in the barnyard or other local producers), in the preparation of the local canned food, in the demonstration of different rites and rituals.

What lies at the heart of the rural tourism in Bulgaria is the **humanism** of Bulgarian village, expressed both by the hospitality of the hosts and the local population, and by the exterior and interior of the Bulgarian country house which has preserved its **friendly** message.

A typical and well-developed form of rural tourism in Bulgaria is the rental of villas and houses. Usually they are rented by companies and the goal is **fun and spending some quality time with friends**.

Usually, rural and agricultural tourism in Bulgaria are developed in the mountainous and hilly regions of the country. Besides their unique nature, many of these regions are known for their specific dishes and food products, which have excellent quality and ecological characteristics. Therefore, the abundance of the natural factor, the immediate contact with nature and the delicious and high-quality food are typical for the Bulgarian rural tourism product.

After all, tourist service should be aimed at providing happiness for tourists (the Wellness concept). This leads to the **conclusion** that Bulgarian rural tourism product covers the main factors related to the happiness of people. Therefore, rural and agrarian tourism in Bulgaria can be regarded as part of the "Global Factory for Happiness" and as opportunities for a better life.

With regard to the development of rural and agricultural tourism (as a form of the rural one) in terms of providing conditions for a better life, opportunities should be sought in tourist areas which offer the necessary natural and anthropogenic tourist resources.

Bulgaria is divided into 9 tourist regions and, depending on the natural and anthropogenic resources available, each of the regions has a certain specialization in the field of specialized types of tourism. The regions are as follows [4]: 1. Danube Region; 2. Stara Planina Region; 3. Sofia Region; 4. Thrace Region; 5. Rose valley Region; 6. Rila-Pirin Region; 7. Rhodopes Region; 8. North Black Sea Region; 9. South Black Sea Region (fig. 1).

Fig. 1. Tourist regions in Bulgaria
Source: Conception for tourist zoning of Bulgaria, 2015.

From the above tourist regions, the major specialization of the Rhodopes region (7) is mountain and rural tourism, while in the Stara Planina region (2) rural tourism is included in the additional tourist specialization of the region. In fact these are the two regions in the country where the opportunities for the development of rural tourism are the best. Nevertheless, there are good opportunities in the Rila-Pirin region, the Rose valley region and the Danube region, as well.

Therefore, considering rural tourism - and in particular agricultural tourism since it is a form of rural tourism - as a factor of happiness and, accordingly, an opportunity to provide a better life, it can be argued that it can thrive and offer a quality and competitive product on the territory of the whole country. Of course, in terms of rural and agricultural tourism, priority should be given to the development and promotion of those areas where natural, anthropogenic and socio-economic conditions are the best. Basically, these are the tourist regions of Rhodopes and Stara Planina, and in part the tourist regions of Danube, Rila - Pirin and Rose Valley.

CONCLUSIONS

Happiness is a concept that is associated with certain emotions and sensations strictly individual for each person. Nevertheless, some basic parameters can be determined, which can be characterized as factors of happiness. If these factors are present, accordingly, the individual feels happier, which increases the quality of life.

On this basis, the factors of happiness can be seen as elements covered in the Bulgarian rural tourism product, which leads to the **conclusion** that ***rural and agricultural tourism in Bulgaria can be regarded as part of the main factors of human happiness and as an opportunity to provide conditions for a better life.***

In fact, these factors of happiness are also part of the priority elements of rural tourism product offered in Bulgaria:

-Social contacts and human interaction;
-Efficient use of free time;
-Physical activity as a form of combating stress factors;
-Comparatively cheaper rest, compared to other forms of specialized tourism;
-Food of excellent quality and environmental characteristics;
-Accommodation with friendly atmosphere;
-Opportunities to slow down and relax;
-Unique rural tourist animation;
-Carrying out voluntary activities;
-More reasons to smile and experience positive mood and thoughts;
-Application of folk medicine;
-Immediate contact with nature;
-High degree of diversity and (especially for the holidays of tourists from major cities and tourist resorts [2]) supply of quality food products, etc.

Rural and agricultural tourism in Bulgaria should be developed as a priority in the tourist regions of Rhodopes and Stara Planina. Good opportunities exist in other tourist regions of the country, such as Rila – Pirin, Danube and Rose Valley.

REFERENCES

[1]Aleksandrov, K., 2016, Opportunities for creation of integrated tourism product (following the example of the municipality of Velingrad). Scientific Papers Series-Management, Economic Engineering in Agriculture and Rural Development, 16 (3):37 – 44.

[2]Aleksandrov, K., Ikova, Y., 2016, Cultural tourism – part of the sustainable tourism in the city of Plovdiv. Specialized types of tourism – challenges and prospects, Research papers of the Agricultural University, 60 (1):153 – 160.

[3]Beciu, S., Mann, S., Arghiroiu, G., 2018, Challenges of population development and value chains in Romanian mountain areas. Scientific Papers Series-Management, Economic Engineering in Agriculture and Rural Development, 18 (1):81 – 84.

[4]Conception for tourist zoning of Bulgaria, 2015.

[5]Popescu, A., 2016, The position of tourist and agrotourist guesthouses in Romania's accommodation structures. Scientific Papers Series-Management, Economic Engineering in Agriculture and Rural Development, 16 (1):417 – 424.

[6]Popescu, A., Plesoianu, D., 2017, Trends of tourist arrivals and overnight stays in the Maramures county, Romania, 2007-2016 and forecast for 2017-2021. Scientific Papers. Series "Management, Economic Engineering in Agriculture and rural development", Vol. 17)(4):281-292.

[7]9 things make us happier, according to science (9 неща ни правят по-щастливи, според науката), https://nauka.offnews.bg/news/Razni_17/9-neshta-ni-

praviat-po-shtastlivi-spored-naukata_50048.html, Accessed on 06.04.2019.
[8]6 secrets of happiness from the point of view of science (6 тайни на щастието от гледна точка на науката), https://www.manager.bg, Accessed on 03.04.2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ESTIMATION OF THE OPTIMAL NITROGEN FERTILIZER APPLICATION FOR DIFFERENT INPUT/OUTPUT PRICES AND VARIETIES OF TRITICALE (× *TRITICOSECALE* WITTM.) IN BULGARIAN THRACIAN PLAIN AND DOBRUJA REGION

Hristofor KIRCHEV, Ivan PENOV

Agricultural University, 12 Mendeleev Blvd, Plovdiv, Bulgaria Phone:+35932654441, Fax:+35932633157, Mobile:+359899386747, Emails: hristofor_kirchev@abv.bg, ipenov@au-plovdiv.bg

Corresponding author: ipenov@au-plovdiv.bg

Abstract

Triticale is known with its high grain yield potential. This man-made plant is interesting also because its nutritional value which exceeds those of wheat and rye. Triticale breeding studies focus on productivity, green mass, nutritional content, etc. These studies showed the importance of nitrogen fertilizer optimization for triticale. This article focuses on the economic issues of such experiments and provides a systematic approach for studying these aspects. First, the production function is constructed, estimated and the main issues related to this process are discussed. Second, the maximum yield is determined, considering: the variety of triticale; the differences in the regions where the experiments were conducted; and the weather conditions. Third, the yield that maximizes the profit is calculated using the current prices of triticale and nitrogen fertilizer. Finally, the demand for nitrogen fertilizer is estimated. The presented frame can be expanded and to include more parameters.

Key words**:** *triticale, production function, optimization*

INTRODUCTION

Triticale (× *Triticosecale* Wittmack) is an amphiploid created by interbreeding of two different plants - wheat and rye. The first fertile hybrids occurred from an intergeneric (interspecies) hybridization. Most of the current varieties are descendants of the primary hybrids, which have either common (*Triticum aestivum* L.) or durum (*Triticum durum* Desf.) wheat as a female parent and cultivated rye (Secale cereale L.) as a male parent [6] [10] [12].

Triticale is a crop that exhibits a high productive potential. This is inherited from the dense spike of wheat and the long spike of rye [3] [4] [11] [13].

The combination of the rye's resistance to biotic stress with the wheat's high yield potential resulted in the man-made small grain Triticale (× *Triticosecale* Wittmack). This artificial plant is interesting because of its nutritional value that largely surpasses those of wheat and rye. Triticale breeding studies often focus on major agronomic features such as grain yield, biomass, nutritional value, earliness etc. [2] [8] [9].

Apart from the properties of different cultivars, not many studies have been conducted on crop management and optimization. These studies [1] [5] [7] [14] showed the importance of nitrogen fertilizer optimization for triticale yield. All of them however, consider mainly the technical parameters of the relation between the yield and level of fertilization, quality of the grain ext. In addition, most of the authors work with small data sets and this result in unreliable coefficient when regression analysis is used.

This article focuses on the economic issues of such experiments and provides a systematic approach for studying these aspects. First, the production function is estimated and the main issues related to this process are discussed. Second, the maximum yield is determined, considering: the variety of triticale; the differences in regions where the experiments were conducted; and the weather conditions. Third, the yield that maximizes the profit is calculated using the current prices of triticale

and nitrogen fertilizer. Finally, the demand for nitrogen fertilizer is estimated. The presented frame can be expanded to include more parameters.

MATERIALS AND METHODS

For determining the triticale nitrogen optimal application, data from two parallel field trials have been used. The one was carried out in the northern Bulgaria in the region of Dobruja (43°39'33.0"N 28°02'05.5"E) on *Luvic Phaeozem* soil, and the other – in the southern Bulgaria, Thracian valley (42°08'26.2"N 24°48'21.1"E) on *Mollic Fluvisol* soil, respectively. Five varieties have been examined – AD-7291 (standart), Rozen, Sadovec, Rakita and Zariad. Four nitrogen rates were tested - N_0, N_6, N_{12} and N_{18} kg/da. The trials were set following the split-plot method in 4 replications, the size of the experimental area being 15 m^2.

The production function describes the link between the level of production and the application of inputs. In this article the yield is a function of the applied nitrogen fertilizer, the variety of triticale, the region where the experiments were conducted, and the nature conditions. The effect of nitrogen fertilization is modelled with a cubic function.

In order to estimate the differences in the yields between the varieties and the influence of nature conditions dummy variables are used. There are four variety of triticale and therefore three dummy variables are included into the regression equation. The base variety is assumed to be AD-7291. The experiments are conducted in two regions and therefore one dummy variable is included. The base category in this case is the experiment conducted in Dobruja area. All varieties are expected to have higher yields compared to AD-7291 and also that the yields in Dobruja region is higher compared to these in Thracian valley.

The weather conditions could be very different at least for one of the years during the experiment. If we do not control for them we may have a model misspecification or omitted variable. In this case the regression coefficients could be bias. We control for the weather with two dummy variables for the second and third year of experiment.

Table 1. Definition of variables

Variables	Definition	Measure	Expected sign
Yield	Dependent variable	kg/da	
Fertilization			
Nitrogen	Continuous variable	kg/da	+
Nitrogen^2	Continuous variable		-
Varieties			
AD-7291	Based category	0	
D-Rakita	Dummy variable	1 if Rakita	+
D-Sadovec	Dummy variable	1 if Sadovec	+
D-Rozen	Dummy variable	1 if Rozen	+
D-Zariad	Dummy variable	1 if Zariad	+
Location			
Dobruja	Based category	0	
D- Thracian valley	Dummy variable	*1 if Thracian valley*	-
Nature			
First year of experiment	Based category	0	
D-Second year of experiment	Dummy variable	1 -if second year	+/-
D-Third year of experiment	Dummy variable	1 -if second year	+/-

Source: Own construction.

The base category is the first year of experiment. The definition of the variables is presented in Table 1.

The biological optimum is the level of nitrogen application that produces maximum yield. In order to determine this level the standard procedure for maximizing a function is used.

The first order condition requires that the first derivative of the production function to be equal to zero.

This means that marginal physical product (MPP) of nitrogen must be equal to zero or the last kilogram of nitrogen produces zero additional production. The second order conditions require that the second derivative of the production function to be smaller than zero.

This means that the marginal physical product of fertilizer should decline.

$$\max_x \; y = f(x, D_i)$$
$$FOC: \quad y' = f'(x) = 0 \quad \Rightarrow \quad MPP = 0$$
$$SOC: \quad y'' = f''(x) < 0 \quad \Rightarrow \quad MPP' < 0 \; for \; maximum$$

The economic optimum is the level of nitrogen application that generates maximum profit. In order to determine this level first the profit function is constructed. The profit is equal to revenue minus cost. The revenue equals to the price (p) multiplied by the production function of triticale –f(x). The cost is price of nitrogen fertilizer (v) multiplied by the quantity of fertilizer used (x). Again the standard procedure for maximizing a function is used. The first order condition requires the first derivative of the profit function to be equal to zero. This means that value of marginal physical product of nitrogen should be equal to the price of nitrogen. The second order condition requires the second derivative of the profit function to be smaller than zero. This means that the marginal physical product of fertilizer must decline.

$$\max_x \Pi = pf(x, D_i) - vx - FC$$
$$FOC: \quad \Pi' = pf'(x) - v = 0$$
$$\Rightarrow \; pMPP - v = 0$$
$$\Rightarrow \; pMPP = v$$
$$SOC: \quad \Pi'' = pf''(x) < 0$$
$$\Rightarrow \; MPP' < 0 \; for \; maximum$$

RESULTS AND DISCUSSIONS

The descriptive statistics and the correlation matrix are presented in table 2. The total number of observation is 100. The average yield for the period is 425 kg/da. The lowest yield recorded is 144 kg/da, while the highest is 933 kg/da.

The regression results are presented in the table 3. For the first model F-statistics is 62.4, which indicates that the independent variables included in the model contribute well to explanation of the dependent variable (the average yield). The R^2 is 0.86 indicating that the model describes well the experimental data. All regression coefficient are statistically significant at 0.05 level, except for the dummy variables for Sadovec variety and for the third year of experiment. Therefore, statistical support is not found for the yields' differences between the control-AD-7291 and Sadovec. Statistical support was also not found for the differences between the meteorological conditions of the first and third year.

One question that we need to answer is what to do with the variables that are not statistically significant. If we do not find statistical support for their influence on the yield we can drop them from the model unless there are strong theoretical arguments in their favour. In our case, we drop the dummy variables for Sadovec variety and for the third year of the experiment and estimated the model again.

For the second model F-statistics is 80.17 and R^2 is equal to 0.86. All variables are statistically significant. The yield from the base variety AD-7291 is lower compared to Rakita variety with 160.7 kg/da, to Rozen variety with 52.2 kg/da, and to Zariad variety with 43.3 kg/da. Due to more suitable soil and nature conditions in Dobruja area, the yields in Thracian valley are on average lower with 202.91 kg/da. During the second years of the experiment due to better weather conditions the yields were higher with 125.11 kg/da compared to the other two years.

$$\max_x y = 333.2249 + 19.9703x - 0.5286x^2 + 160.7Drakita + 52.2Drozen + 43.3Dzariad + 125.11436Dsecond\ year$$

Taking the first and second derivative of the production function we obtain the level of fertilizer application for achieving the maximum possible yield – 18.89 kg/da. After substituting this level of nitrogen in the production function we can obtain the maximum yield.

$$\max_x \Pi = 0.3(333.2249 + 19.9703x - 0.5286x^2 + 160.7Drakita + 52.2Drozen + 43.3Dzariad + 125.11436Dsecond\ year) - 0.4x$$

In order to obtain the economic optimum, first profit function is constructed. We use the current price of triticale -0.40 leva/kg and the price of nitrogen fertilizer -0.30 leva/kg.

Taking the first and second derivative of the profit function against, we obtain the level of fertilizer application for achieving maximum profit – 17.63 kg/da. After substituting this level into the production we obtain the yields that maximize the profit. The calculated yields are presented in the Tables 4 and 5.

Table 2. Descriptive statistics

	Depend.	Fertilization		Varieties				Nature		Location
	Yield	*Nitr.*	*Nitr.^2*	*D-Rakita*	*D-Sadovec*	*D-Rozen*	*D-Zariad*	*D-Second year*	*D-Third year*	*D-Thracian valley*
Mean	425.89	9.00	126.00	0.20	0.20	0.20	0.20	0.40	0.40	0.60
St. Error	16.94	0.67	12.66	0.04	0.04	0.04	0.04	0.05	0.05	0.05
St. Dev.	169.41	6.74	126.63	0.40	0.40	0.40	0.40	0.49	0.49	0.49
Min.	144.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max.	933.00	18.00	324.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Count	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Own construction

Table 3. The effect of production factors on triticale yields (Production function)

Varieties	Model 1			Model 2		
	Coefficients	*t Stat*	*P-value*	*Coefficients*	*t Stat*	*P-value*
Intercept	354.5570	13.10	0.00	333.2249	18.01	0.00
Fertilization						
Nitrogen	19.9703	5.80	0.00	19.9703	5.80	0.00
Nitrogen^2	-0.5286	-2.88	0.00	-0.5286	-2.89	0.00
Varieties						
D-Rakita	161.6000	7.74	0.00	160.7000	8.90	0.00
D-Sadovec	1.8000	0.09	0.93			
D-Rozen	53.1000	2.54	0,01	52.2000	2.89	0.00
D-Zariad	44.2000	2.12	0.04	43.3000	2.40	0.02
Location						
D-Thracian valley	-210.3250	-14.24	0.00	-202.9143	-14.86	0.00
Nature						
D-Second year	106.5875	5.46	0.00	125.1143	9.16	0.00
D-Third year	-25.9375	-1.33	0.19			
	R Square=0.86; F=62.4; n=100			R Square=0.86; F=80.17; n=100		

Source: Own construction

The differences between the biological and economics yields are not large. However, in turn of the fertilizer use, the difference is more than one kilogram per decar.

This may not seem an important, but if a farmer cultivates 50 thousand decares he can save around 50 tons of fertilizer with a value of 20,000 leva (10,000 EUROS). This estimation concerns only the money paid for fertilizer, but does not include the transport and distribution costs.

Deriving the demand for nitrogen fertilizer from the profit function allows calculating the changes of optimal level of fertilizer for different prices of triticale and nitrogen fertilizer.

When the price of nitrogen goes up and the price of grain goes down, the optimal use of fertilizer decreases. The estimated values are presented in Table 6.

$$\max_x \Pi = p(333.2249 + 19.9703x - 0.5286x^2 + 160.7\text{Drakita} + 52.2\text{Drozen} + 43.3\text{Dzariad} + 125.11436\text{Dsecond year}) - vx$$

$$\Rightarrow x = 18.88943773 - 0.945874934V/P$$

Table 4. Biological and economic optimum for Dobruja region

Variety		Dobruja			
		First and third year		Second year	
		Biological	Economic	Biological	Economic
Nitrogen	kg/da	18.88944	17.62830	18.88944	17.62830
AD-7291/Sadovec					
Yield	kg/da	521.84	521.00	646.95	646.11
Conditional Profit	leva/da	149.00	149.25	186.53	186.78
Rakita					
Yield	kg/da	682.54	681.70	807.65	806.81
Conditional Profit	leva/da	197.21	197.46	234.74	234.99
Rozen					
Yield	kg/da	574.04	573.20	699.15	698.31
Conditional Profit	leva/da	164.66	164.91	202.19	202.44
Zariad					
Yield	kg/da	565.14	564.30	690.25	689.41
Conditional Profit	leva/da	161.99	162.24	199.52	199.77

Price of triticale =0.30 leva/kg; Price of nitrogen=0.40leva/kg

Source: Own estimation

Table 5. Biological and economic optimum for Thracian valley

Variety		Thracian valley			
		First and third year		Second year	
		Biological	Economic	Biological	Economic
Nitrogen	kg/da	18.88944	17.62830	18.88944	17.62830
AD-7291/Sadovec					
Yield	kg/da	318.92	318.08	444.04	443.20
Conditional Profit	leva/da	88.12	88.37	125.66	125.91
Rakita					
Yield	kg/da	479.62	478.78	604.74	603.90
Conditional Profit	leva/da	136.33	136.58	173.87	174.12
Rozen					
Yield	kg/da	371.12	370.28	496.24	495.40
Conditional Profit	leva/da	103.78	104.03	141.32	141.57
Zariad					
Yield	kg/da	362.22	361.38	487.34	486.50
Conditional Profit	leva/da	101.11	101.36	138.65	138.90

Price of triticale = 0.30 leva/kg; Price of nitrogen = 0.40 leva/kg

Source: Own estimation.

Table 6. The optimal use of fertilizer depending on price changes

Price of fertilizer leva/kg	Price of triticale leva/kg			
V	p= 0.4	p= 0.3	p= 0.2	p= 0.1
	Economic optimum - Nitrogen kg/da.			
0.10	18.6530	18.5741	18.4165	17.9436
0.20	18.4165	18.2589	17.9436	16.9977
0.30	18.1800	17.9436	17.4706	16.0518
0.40	17.9436	17.6283	16.9977	15.1059
0.50	17.7071	17.3130	16.5248	14.1601
0.60	17.4706	16.9977	16.0518	13.2142
0.70	17.2342	16.6824	15.5789	12.2683
0.80	16.9977	16.3671	15.1059	11.3224
0.90	16.7612	16.0518	14.6330	10.3766
1.00	16.5248	15.7365	14.1601	9.4307
1.10	16.2883	15.4212	13.6871	8.4848
1.20	16.0518	15.1059	13.2142	7.5389
1.30	15.8153	14.7906	12.7413	6.5931

Source: own calculation.

CONCLUSIONS

The present study was conducted to evaluate the optimal nitrogen fertilized for varieties of triticale. It focuses on the economic aspects and determines the optimal level of nitrogen application for different input-output prices. The presented frame can be expanded and to include more parameters.

We found statistical support that the yields of Rakita, Rozen, Zariad variety are higher compared to the one of AD-7291-the standard. However, we did not find statistical support for the differences between the standard and Sadovec variety. We also found that the yields in Dobruja area are higher compared to these in Thracian valley. The weather conditions during the second year of the experiment were favourable and the yields were higher compared to the first and second year. Using the current prices, the differences in nitrogen application in biological and economic optimum is about 1 kg/da. Derived demand function for nitrogen fertilizer allows optimal level to be determined for different input/output prices.

The relation between the nitrogen fertilization and yield is best described by the neoclassical production function. This function has three distinctive production phases. The first phase starts at zero application of nitrogen and ends up where marginal physical product (MPP) becomes equal average physical product (APP) of nitrogen. The second phase ends up where marginal physical product becomes zero. This coincides with the maximum production. In our study we use quadratic function for the relation between the nitrogen fertilization and yield. The quadratic function shows only two phases of production-second and third. In order to capture the property of all three phases however, more experimental data are needed for the first phase.

REFERENCES

[1]Bielski, S. Dubis, B. Budzyński, W., 2015, Influence of nitrogen fertilization on the technological value of semi-dwarf grain winter triticale varieties Alekto and Gniewko. Polish Journal of Natural Sciences. Vol 30(4): 325–336.

[2]Grabovets, A. I., Popova, O. G., 2015, Breeding of winter triticale for use in confectionery production. Russian Agricultural Sciences. 41(6): 411-414.

[3]Gerdzhikova, M., 2014, Influence of N fertilization and predecessors on triticale yield structure characteristics. Turkish Journal of Agricultural and Natural Sciences. Special Issue 2. 1922-1932.

[4]Ivanova, A., Tsenov, N., 2014, Production potential of new triticale varieties grown in the region of Dobrudzha. Agricultural Science and Technology 6(3): 243-246.

[5]Kirchev, H., Delibaltova, V., Yanchev, I., Zheliazkov, I., 2012, Comparative investigation of rye type triticale varieties grown in the agroecological conditions of Thrace valley. Bulgarian Journal of Agricultural Science. 18(5): 696-700.

[6]Losert, D., Maurer, H. P., Marulanda, J. J., Würschum. T., 2017, Phenotypic and genotypic analyses of diversity and breeding progress in European triticale (× *Triticosecale* Wittmack). Plant Breeding. 136(1):18-27.

[7]Madic, M., Đurovic, D., Paunovic, A., Jelic, M., Kneževic, D., Govedarica, B., 2015, Effect of nitrogen fertilizer on grain weight per spike in triticale under conditions of central Serbia. VI International Scientific Agricultural Symposium "Agrosym 2015". Jahorina. Bosnia and Herzegovina. October 15-18. 2015. Book of Proceedings 2015, 483-487.

[8]Moskalets, T. Z., Vasylkivskyi, S. P., Morgun, B. V., Moskalets, V. I., Moscalets, V. V., Rybalchenko, V. K., 2016, New genotypes and technological indicators of winter triticale. Biotechnologia Acta. (9. № 1), 79-86.

[9]Priya, B., Diyali, S., Mukherjee, S., Srinivasarao, M., 2015, Genetic diversity based on cluster and principal component analysis in wheat and triticale genotypes. Research on Crops. 16(4): 712-718.

[10]Mergoum. M., Gómez-Macpherson, H., 2004, Triticale improvement and production. FAO Plant Production and Protection Paper. 179, 1-59.

[11]Ramazani, S. R., Tajalli, H., Ghoudsi, M., 2016, Evaluation of grain yield stability of superior triticale genotypes. Bulgarian Journal of Agricultural Science. 22(6): 976-981.

[12]Siriamornpun, S., Wootton, M., Schultheiss, J.B., 2004, Potential of capillary electrophoresis for identification of Australian triticale varieties. Australian Journal of Agricultural Research. 55(5): 595–598.

[13]Stoyanov, H., Baychev, V., 2015, Correlations between spike parameters of first generation direct and reciprocal crosses of triticale (× *Triticosecale* Wittm.). Agrarni Nauki. 7(18): 25-34.

[14]Wojtkowiak, K., Stępień, A., Markowska, M., 2015, Effect of nitrogen fertilization method on the yield and quality of Milewo variety spring triticale grain. Polish Journal of Natural Sciences. Vol 30(2): 173–184.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

DNA-TYPE RESULTS SWINE FOR MS4R-GENE AND ITS ASSOCIATION WITH PRODUCTIVITY

Volodymyr KOZYR[1], Viktor KHALAK[1], Mykhola POVOD[2]

[1]State Institution Institute of Grain Crops of the National Academy of Sciences of Ukraine, 14, Vernadsky St., Dnipro, Ukraine, E-mail: izkzoo3337@gmail.com, v16kh91@gmail.com
[2]Sumy National Agrarian University, 160, H. Kondratiiev St., Sumy, Ukraine, Phone: +38(066)2871386, E-mail: nic.pov@ukr.net

Corresponding author: nic.pov@ukr.net

Abstract

The peculiarities of growth, development and fattening qualities of young pigs of different genotypes evaluated by the MC4R gene (marker of meat and fattening qualities, their association with productivity were determined). The true difference between animals of different genotypes (GG, AA and AG) is set at live weight at 3 months of age (4.9-5.2 kg), age of achievement live weight 100 kg (GG – Ag, 7.1 days), thickness of the sphinc at 6-7 thoracic vertebrae (GG – AA – 3.7 mm, GG – AG – 2.1 mm), body length and the chest circumference of the shoulder blades at the age of 6 months (AG – GG, 1.3-1.8 cm). According to O. Wangen's index, the GG genotype is an essential advantage in animals. Compared to the peers of the genotype AA and AG, the difference was 44.86-37.73 %.

Key words*: young pigs, growth, development, fattening qualities, DNA-typing, gene, productivity*

INTRODUCTION

Providing the population with a full and sufficient quantity of food was and remains one of the most pressing problems of our time. The experience of advanced states shows that the elimination of the deficit of meat by more than 42.0 % is solved by the pig industry. This is due to the biological characteristics of animals of this species, as well as the creation of optimal conditions for feeding and maintenance for them.

Great importance is the breeding of highly productive breeds and the introduction of innovative methods for assessing the breeding value of pigs of various sex and age groups.

An important issue for increasing the gross production of pork is to solve the problems associated with the reproduction of the herd, increasing the level of fattening and meat qualities of young pigs, obtained using different breeding schemes. Achievement of this goal is impossible without the use of genetic-molecular techniques for the creation of populations of herds of pigs, with a high and stable level of productivity. This is a prerequisite for the economically expedient operation of specialized pork farms.

One of the factors for accelerating the breeding process in the pig breeding industry is the use of marker-associated selection (MAS) [18, 4, 13, 8]. This direction allows the creation of herds of animals with a high reproductive capacity of sows and breeders, fattening and meat qualities of their offspring. Such a practice in animal husbandry has already been launched in a number of foreign countries, as well as in Ukraine.

Domestic and foreign scientists conduct a lot of research on the use of genetic methods in breeding work. Kostenko et al. [10], Yepishko et al. [16] studied the association of the polymorphisms of the EHR, PRLR, FSHβ and RYR1 genes and showed a positive effect of combining the desired genotypes with the reproductive function of sows and buds. In this case, the frequency of occurrence of the genotype ESRVVFSHßBV, which positively affects the reproductive function of the pediatricians, was 12 %.

The problem of the use of the relationship of DNA markers in the selection of pigs was also studied by Bannikova [2], Het'mantseva et al. [5], Domashova [3], Zinov'ieva et al. [17] and others.

The above determines the relevance and vector of our research and meets the requirements of the present to solve the problem of organizing economically feasible production of competitive pork in Ukraine.

MATERIALS AND METHODS

The aim of the work was to study the peculiarities of the growth, development and fattening characteristics of young pigs of different genotypes evaluated by the MC4R gene (marker of meat and fattening qualities) and to establish its association with animal productivity indices. The object of research was sows, puppets, pedigrees and young animals of large white pigs. In this case, genetic, genetic, zootechnical, laboratory, statistical, and economic methods were used. The place of research is the Animal Livestock Laboratory of the Institute of Grain Crops and Genetics of the Institute of Pigbreeding and AIP of the National Academy of Agrarian Sciences, «Druzhba-Kaznacheevka» LTD of the Dnipropetrovsk Region.

The estimation of young pigs on the basis of growth, development and fattening qualities was carried out taking into account the following absolute and integrated indicators: absolute (kg), average daily (g) and relative (%) increments of live weight from birth to age reaching a live weight of 100 kg; Body length at the age of 6 months, cm; girth of the breast for shoulder blades at 6 months, cm; age of achievement of live weight 100 kg (days); Eyrosomy Index and Wangen Index (1):

$$ILN = \frac{n}{2.5 - (\frac{x_{max} - x_{min}}{\overline{X}})} \quad (1)$$

where: ILN – index of the leveling of the sow's nest for the live weight of piglets on the date of their birth, points; n – multiplicity of sow, heads; 2.5 – the maximum indicator of live weight of one piglet on the date of birth, kg; x max – live weight of the heaviest piglet in the nest, kg; x min – live weight of the easiest piglet in the nest, kg; $\overline{X}$ – average live weight of piglets in the nest on the date of birth (large sows), kg [6];

$$I = B + (2 \times H) + (35 \times G) \quad (2)$$

where: B – the number of live piglets on the date of the nation (sowing multiplicity), heads; H – number of piglets on the date of receipt, heads; G – middle-dredged growth of livestock mice piglets before weaning, kg [9];

$$\text{Index of eurysomya} = \frac{\text{chest girth behind the shoulder blades}}{\text{length of trunk}} \times 100\ \% \quad (3)$$

$$I = \frac{1}{\sigma_{AD}} \times AD + \frac{1}{\sigma_{TF}} \times TF, \quad (4)$$

where: I – Wangen index, AD – average daily gain of live weight from birth to achieve a living weight of 100 kg, g; TF – thickness of fat at 6-7 thoracic vertebrae, mm; σ AD – phenotypic standard deviation of the average daily gain of live weight, g; σ TF – phenotypic standard deviation of the thickness of the spike, mm [11].

The index of eurysomya was calculated according to the technique of Akimov et al. [1]. Measuring the thickness of the spike was performed using the Renko Lean Meater Digital Backfat Idic, S / N 46080. Measuring the thickness of the wire rod using the Renko Lean Meater Digital Backfat Idic, S / N 46080.

The economic efficiency of research results was calculated according to the formula:

$$E = C \times \frac{C \times P}{100} \times L \times K, \quad (5)$$

where: E – the cost of additional products, UAH; C – the existing purchase price per unit of product in Ukraine (UAH); P – average productivity of animals; P – average increase of basic production (%), expressed as a percentage of 1 head in the application of a new and improved breeding achievement compared with the productivity of animals of basic use; L – constant coefficient of reduction of the result, which is associated

with additional costs for profitable production (0.75); K – number of animals of a new or improved breeding achievement, heads [9].
Results of researches were worked out statistically according to the method of G. Lakin [12].

RESULTS AND DISCUSSIONS

Experimental sows of large white breed are characterized by the following indices of reproductive ability (n=15): multiplicity equal to 11.4±0.76 heads (Cv=25.92 %), high fertility – 1.32±0.029 kg (Cv=8.48 %), the weight of the nest at the farrowing date is 15.1±0.43 kg (Cv=11.10 %), the level of the sow's nest for the live weight of the piglets at the farrowing date is 6.95±0.479 points (Cv=26.70 %), the number of piglets for the date of weaning at the age of 28-32 days – 9.8±0.29 heads (Cv=11.40 %), the weight of the nest for the date of weaning – 95.3±3.56 kg (Cv=14.48 %), average daily increment of live weight of piglets before weaning – 0.241±0.0101 kg (Cv=13.35 %), index L. Lasha in modification of Berezovsky M.D. – 39.61±1.738 points (Cv=13.16 %). The results of research on the reproductive capacity indices of large white breeds of sows in combination with sucking-pigs of a similar genotype of English and Hungarian breeding are produce in Table 1.

Table 1. Indices of reproductive capacity of sows of large white breed (LTD «Druzhba-Kaznacheevka» of Dnipropetrovsk region)

Indicators (signs)	Biometric Indicators	Combination	
		GV × GVES	GV × GVUS
Born pigs of all, heads	N	5	10
	$\overline{X} \pm S\overline{x}$	11.0±0.70	12.7±1.30
	Cv,%	14.37	32.58
Including born alive pigs, heads	$\overline{X} \pm S\overline{x}$	10.8±0.58	11.8±1.123
	Cv,%	12.07	30.10
Weight of the nest at birth, kg	$\overline{X} \pm S\overline{x}$	15.1±0.80	15.4±0.54
	Cv,%	11.91	11.34
Femininity, kg	$\overline{X} \pm S\overline{x}$	1.40±0.008	1.34±0.044
	Cv,%	1.27	10.36
Leveling nests for live weight of piglets at birth, points	$\overline{X} \pm S\overline{x}$	7.34±0.401	6.76±0.699
	Cv,%	12.23	32.68
Number of piglets before weaning, heads	$\overline{X} \pm S\overline{x}$	10.2±0.583	9.7±0.33
	Cv,%	12.78	10.92
Mass of the nest at weaning, kg	$\overline{X} \pm S\overline{x}$	94.8±3.67	95.6±5.16
	Cv,%	8.67	17.06
Average daily gain of live weight of piglets before weaning, kg	$\overline{X} \pm S\overline{x}$	0.245±0.004	0.241±0.010
	Cv,%	4.48	13.35
L. Lasha index in modification by M. D. Berezovsky, points	$\overline{X} \pm S\overline{x}$	39.72±1.611	36.61±1.738
	Cv,%	9.06	13.16

Source:Authors' calculations.

The maximum multiplicity indices, the weight of the nest at birth and the weight of the nest at weaning are set in sows of a large white breed of Ukrainian breeding in combination with chicks of a similar genotype of Hungarian breeding.
According to L. Lash's index, in the modification of M.D. Berezovsky, the animals showed a superiority of combinations of Ukrainian breeding moths with breeds of a similar genotype of English breeding.
DNA isolation was carried out using Chelex 100 ion exchange resin Tcserenyuk O.M. [15]. For DNA typing, the PCR-PDRF method was used Stepanov V.I. et al. [14]. PCR was performed using the standard

reaction mixture for the amplification of «Fermentas» (Lithuania) on the Tercik-2 amplifier (DNA technology, Russia) according to the program: denaturation - 94°C 0.5 min, hybridization of primers - 60°C for 0.5 minutes, synthesis - 74° C for 1 min.

For the quantitative analysis of the samples for the melanocortin - 4 receptor gene, an endonuclease TaqI, (MBI Fermentas, Lithuania), using a T ↓ CGA incision, has a restriction temperature of 65 ° C. This process was performed by electrophoresis in a 2.0 % agarose gel.

Visualization was carried out by staining an agarose gel with bromide ethidium with subsequent revision in ultraviolet light on a transilluminator. Photo documentation was performed by a digital camera «Canon».

It was established that the number of animals with genotype AA is 30, GG - 3 heads and AG - 27 heads.

In the study of the peculiarities of growth, development and fattening characteristics of young pigs of different genotypes evaluated by the MC4R gene, it was found that by weight at birth, no significant difference was established between animals (0.05 (td=0.69, P>0.05) – 0.08 kg (td=1.095, P>0.05) (Table 2).

Table 2. Meat and fattening qualities of young animals

Indicators	Biometric Indicators	Genotype		
		AA	GG	AG
Live weight at birth, kg	n	30	3	27
	$\overline{X} \pm S\overline{x}$	1.51±0.028	1.56±0.067	1.48±0.031
	Cv,%	10.49	7.37	11.07
Weight at removal, kg Washing	$\overline{X} \pm S\overline{x}$	9.4±0.23	8.9±0.63	9.9±0.26
	Cv,%	13.61	12.11	13.67
Live weight at 90 days of age, kg	$\overline{X} \pm S\overline{x}$	35.9±1.01	31.0±1.52	36.2±2.34
	Cv,%	15.28	8.53	33.67
Live weight at the age of 6 months, kg	$\overline{X} \pm S\overline{x}$	104.7±0.65	103.3±2.02	103.0±0.64
	Cv,%	3.44	3.42	3.26
Absolute growth of live weight from birth to achieve a live weight of 100 kg,	$\overline{X} \pm S\overline{x}$	102.5±0.65	101.7±2.08	101.5±0.65
	Cv,%	3.48	3.54	3.34
Average daily gain of live weight from birth to achievement live weight 100 kg.	$\overline{X} \pm S\overline{x}$	0.576±0.0040	0.582±0.0086	0.559±0.046
	Cv,%	3.82	2.54	4.29
Overall growth of live weight from birth to achieve a live weight of 100 kg, %	$\overline{X}$	194.2	193.9	194.1
Age of achievement of live weight of 100 kg, days	$\overline{X} \pm S\overline{x}$	171.2±1.19	169.0±2.38	176.1±1.45
	Cv,%	3.80	2.44	4.29
House density of 6-7 thoracic vertebrae, mm	$\overline{X} \pm S\overline{x}$	23.7±0.40	20.0±0.57	22.1±0.45
	Cv,%	9.28	5.00	10.78
Length of the body in 6 months, cm	$\overline{X} \pm S\overline{x}$	115.7±0.32	114.9±0.47	116.2±0.37
	Cv,%	1.52	0.87	1.69
Heat of breast with shoulder blades at 6 months, cm	$\overline{X} \pm S\overline{x}$	108.3±0.42	107.6±0.34	109.4±0.61
	Cv,%	2.16	0.54	2.93
Index of eyrosomya, points	$\overline{X} \pm S\overline{x}$	93.60±61	93.62±0.55	94.14±0.41
	Cv,%	1.72	1.02	2.32
Index of O.Vagen, points	$\overline{X} \pm S\overline{x}$	36.96±0.237	59.36±1.139	32.73±0.304
	Cv,%	3.51	3.32	4.82

Source: The table is filled based on [7].

At 90 days of age, the difference between animals in the genotype AA, AG and peers GG was 4.9 (td=2.70, P<0.01) and 5.2 kg (td=1.86, P>0.05) respectively. It was established that during the period of control feeding of animals, the genotype GG was characterized by maximum daily average increments of live weight (0.582±0.0086 kg) and the minimum value of the sign «age of reaching a living weight of 100 kg, days» (169.0±2.38 days). Compared to those of other genotypes (AA and AG), the difference according to these indices was 0.006 (td=0.63, P>0.05) – 0.023 kg (td=0.50, P>0.05), 2.2 (td=0.83, P>0.05) – 7.1 days (td=2.62, P<0.05).

The absolute and relative growth of live weight from birth to reaching a live weight of 100 kg varied from 101.5 (AG) to 102.5 kg (AA) and from 193.9 (GG) to 194.2 % (AA) .

In the thickness of the spike at the level of 6-7 thoracic vertebra, the difference in favor of young pigs with genotype GG was 3.7 (td=5.78, P<0.001) – 2.1 mm (td=3.08, P<0.01)

The length of the body, the circumference of the breast of the shoulder blade and the index of the eyrosomy of the genotype AG dominated the peers of other genotypes (GG and AA) by 1.3 (td=2.21, P<0.05) – 0.5 cm (td=1.04 , P>0.05), 1.8 (td=2.61, P<0.05) – 1.1 cm (td=1.50, P>0.05) and 0.52 (td=0.76, P>0.05) – 0.54 points (td=0.72, P>0.05).

The maximum index of O. Wangen's index was found in animals of the genotype GG, which is 44.86 (td=22.76, P<0.001) and 37.73 % (td=32.52, P<0.001) more than that of genotypes of the same age (AG and AA).

CONCLUSIONS

Polymorphism by the MC4R gene indicates the potential and effectiveness of marker breeding of the large white breed pigs of the LTD «Druzhba-Kaznacheevka» of the Dnipropetrovsk region.

The true difference between animals of different genotypes (GG, AA and AG) is based on live weight at 3 months of age (4.9-5.2 kg), age of achievement of live weight of 100 kg (GG -Ag, at 7.1 days), thickness of the sphincus at the level of 6-7 thoracic vertebrae (GG - AA - by 3.7 mm, GG - AG - by 2.1 mm), body length and chest circumference at the age of 6 months (AG - GG, 1.3-1.8 cm). According to O. Wangen's index, the GG genotype is an essential advantage in animals. Compared to the peers of the genotype AA and AG, the difference was 44.86-37.73 %.

REFERENCES

[1]Akimov, S.V., Peretyatko, L.G., Kravchenko, A.I., 2005, Method of studying the overall adaptive capacity (ZAZ) of pigs when moving to another farm. Modern methods of research in pig breeding. Poltava, p. 73-74.

[2]Bannikova, A.D., 2012, Polymorphism of DNA markers associated with reproductive qualities in large breed pigs and Yorkshire: author's abstract. Dis. cand. Biol. Sciences. Dubrovitsa, 18 p.

[3]Domashova, L.O., 2013, Association of reproductive qualities of large white breed sows with their estrogen receptor genotype (ESR). Digest of scientific works of VNAU. Modern problems of breeding, breeding and hygiene of animals, 2 (72): 84–89.

[4]Glasko V.I., 2007, DNA technologies: problems and perspectives. Nevs of TACA, 1: 9-20.

[5]Het'mantseva, L.V., Mikhailov, N.V., Kolosov, A.Yu. *et al*., 2013, Polymorphism of the MUC4 gene and reproductive qualities of breed pigs. News of Nizhnevolzhsky agrouniversity complex. Volgogra, Volgograd State Tax Administration, p. 143-146.

[6]Khalak, V.I., 2012, Patent 66551Ukraina, IPC (2011.01) A01K67/02 (2006.01), A61D19/00. Method for determining the leveling of the nest of sows; applicant to the patent Institute of Animal Husbandry of the central areas of the NAAS, clerk to the patent of the SD Institute of the Agriculture of the Steppe Zone of the NAAS. No.2011007148; claimed. 06/06/2011; publ. 10.01.2012, Bul. No.1.

[7]Khalak, V.I., 2018, Fattening and meat qualities of young pigs of different genotypes according to the melanocortin receptor gene - 4 (MC4R) / Prospects for the development of pig breeding in the CIS countries: Coll. scientific tr. Adapted from XXV Intern. scientific practical conf. (Zhodino, August 23-24, 2018) – Minsk: Belarusian Nauka, 2018. p. 102-106.

[8]Kim, K.S., Larsen, N.J., Rothschild, M.F., 2000, Rapid communication: linkage and physical mapping of the porcine melaocortin-4 receptor (MC4R) gene. Journal of Animal Science, 78: 3–16.

[9]Korotkov, V.A., Kravchenko, O.I., Berezovsky, M.D., 2005, Methodology for using indices in the selection of pigs. Modern methods of research in pig breeding. Poltava, p. 51-60.

[10]Kostenko, S.O., 2010, Use of Genetic Markers of Productivity of Farm Animals for Increasing the

Competitiveness of Food Raw Materials. Digest of sciences works of VNUU, 5 (45): 36-41.
[11]Kozlovsky, V.G., Lebedev, Yu.V., Medvedev V.A. et al., 1982, The pedigree business in pig breeding. Moscow: Kolos, 272 p.
[12]Lakin, G.F., 1990, Biometrics. Study Manual for biol. special universities, 4th ed., Moscow: High school, 352 p.
[13]Mikhailov, N.V., Het'mantseva, L.V., Svyagotorov, N.A., Bublyk, E.M., 2013, Prospective genes for markers of pig production. Bulletin of the Don State Agrarian University, 3(9): 16-19.
[14]Stepanov, V.I., Fedorov, V.K., Tarichenko, A.I., 1999, Selection of pigs for meat. Pigbreeding, 2: 21-25.
[15]Tcserenyuk, O.M., 2010, Modification of imported genetic material in Ukraine: monograph. Kharkiv: ICB UAAS, 248 p.
[16]Yepishko, O.A., Pestis, V.K., Mordechko, P.P. *et al*., 2016, Polymorphism of the ESR, PRLR, FSHß and RYR1 genes in the sow population and male breeders of the Belarusian meat breed. Modern technologies of agricultural production: Digest of scientific articles on the materials of the XIX International Scientific and Practical Conference. Grodno: State Agricultural University, p. 167-169.
[17]Zinov'ieva, N.A., Shavyrin, K.M., Adamenko, V.A. et al., 2005, Evaluation of animals by genetic markers. Industrial and breeding pig production, 2: 18-20.
[18]Zinov'ieva, N.A., Gladir, O.O., Lugovoi, S.I. *et al*., 2011, Genetic polymorphism of the BF gene (BF_in1_C79T) in large white pigs of different origins. Scientific Bulletin of LNUVMBT named after S.Z. Gzhytsky, 4 (50): 71-75.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ASPECTS OF AGRICULTURAL MARKETING STRATEGIES FOR THE MAIN CROPS SITUATED IN NORTHERN BĂRĂGAN, ROMANIA

Elena LEONTE[1], Aurel CHIRAN[1], Cătălin Răzvan VÎNTU[2], Maria ROBU[1], Dragoș SMEDESCU[2], Ștefănița MĂCELARU[1]

[1]"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine of Iași, Romania, Sadoveanu Alley No. 3, Iași City, Iași County, Romania, Phone: +40232407407, Fax: +40232260650, Mobile: +40741676108, Emails: egindu@uaiasi.ro, achiran@uaiasi.ro, maria.bogus@yahoo.com.
[2]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, 59 Marasti Blvd, District 1, Bucharest, 011464, Phone: +40213182564, Fax: +40213182888, Mobile: +40741314038, Emails: cvintu@gmail.com, smedescudragos@yahoo.com.

Corresponding author: maria.bogus@yahoo.com

Abstract

In Romania, agriculture is undergoing restructuring and economic development as a result of the changes following the 1989 Revolution. Within this background, agriculture has remained one of the priority branches of the national economy, in close correlation with the level of technical and economic performances achieved worldwide and especially within the agriculture of developed European countries, where technical, scientific and managerial progress has penetrated faster. The authors' intention is to analyse the main aspects related to the marketing actions for the main crops of grain maize, feed barley and rape, within S.C. AGRAR-M SERV S.R.L. company, based in Bordei-Verde, Lișcoteanca Village, Brăila County, for the reference period 2012-2015. In order to achieve the purpose of this paper, we started from compiling the database for the period under review, and thereafter we presented and analysed the natural conditions in the researched area that influenced the production results and, implicitly, the economic and financial ones.

Key words**:** *marketing strategies, development, agricultural marketing, Northern Baragan*

INTRODUCTION

Factors influencing the development of agriculture are divided into three categories: natural, technical and socio-economic [4] (Chiran A. et al., 1995).

Technical factors influence the increase of productions by means of mechanization, chemistry, irrigation, etc., while the influence of the **socio-economic factors** is manifested through the capacity and level of training of the labour force and the entire economic context in which the unit operates [10] (Chirouze Y., 1986).

Agricultural activity is meant to meet the needs of human consumption and the general progress of the economy. In order to maintain and perpetuate the soil quality used for crops, particular attention was paid to ecological and technical standards regarding the quality of work.

The procedures used provided the following:

-The company should not cultivate twice in a row sunflower or sugar beet on the same soil [2] (Axinte M. et al., 2003);

-The burning of stubble fields and land of any kind for cleaning and fertilization purposes was done only when absolutely necessary and with approval from the competent authorities in the territory where such cleaning and care activities took place;

-Earth moving or minimal soil coverage to prevent erosion;

-Avoiding damage to habitats by observing the minimum densities of livestock and appropriate regimes thereof [3] (Bold I., Crăciun A., 1995);

-Maintaining landscapes;

-Protection and maintenance of stubble fields;

-Avoiding the growing of undesirable vegetation on agricultural land, for which

were used various chemical fertilizers and minimally invasive agricultural practices.

MATERIALS AND METHODS

The case study was conducted at S.C. AGRAR-M SERV S.R.L. Company, based in Bordei-Verde, Brăila County, the business object of which consists of field crop cultivation, rendering of services, distribution and placing on the market of agricultural production.

S.C. AGRAR-M SERV S.R.L. company of Liscoteanca concentrates its activity on the following crops: corn, barley, rape and sunflower. The company has modern machines which allow sowing directly into stubble, meeting the standards of each crop and thus ensuring freedom of crop rotation.

In order to prevent diseases and pest control in crops, the company follows recommendations such as: rotation of herbicides, combination of chemical control with crop-based methods of control, compliance of rotation, deep ploughing, seed treatment.

The territory of the undertaking is part of Brăila Plain, and the depressions (converted into lakes) are located in the central part of the plain. The entire area of Brăila Plain is divided into the Southern Bărăgan, Central Bărăgan and Northern Bărăgan. Brăila Plain contains the following landforms: Câmpia Mircea Vodă (Mircea Vodă Plain); Câmpul Ianca (Ianca Field) or Movila Miresei (Miresei Hill); Câmpul Viziru (Viziru Field); Câmpul Gemenele-Romana (Gemenele-Romana Field) and Valea Iencii (Iencii Valley).

The average annual temperature varies between 10.3 ^{o}C and 10.5 ^{o}C. Annual rainfall (per agricultural year) was 447 mm, potential evapotranspiration was 705 mm, and the water deficit reached 258 mm (according to Brăila Meteorological Station)**.**

Brăila Plain is a dry area characterized by high water scarcity due to climate: 2.50 mm in moderate years, 100-150 mm in wet years and 300-350 mm in dry years.

Chernozems occupy 70-75% of the area of Brăila County and cover a highly varied range: *brown and dark brown chernozems; carbonated chernozems; compacted leached clayey chernozems; sandy leached chernozems; alluvial chernozems.*

The accumulated humus content, especially in the A saturation horizon, varies between 2.8 and 5.7%, and calcium carbonate reaches saturation horizon C up to 14-23%.

RESULTS AND DISCUSSIONS

S.C. AGRAR-M SERV S.R.L. Company of Lişcoteanca, Brăila County, constantly follows the implications of the competition policy in developing and perfecting new products and applying new product strategies specific to competitive organic products.

Also, price strategies for agricultural products, distribution and promotion strategies specific to agri-food products and actions directed to the integration of marketing policies and strategies into the company's mission and overall objectives are targeted and implemented [12] (Dona I., 2000).

The company pays a great deal of attention to environmental quality in the actions it carries out, and therefore in the day-to-day agricultural activities it uses minimal invasive methods to preserve a competitive soil, quality fertilizers, but also composts, so as not to influence soil quality over time, and modern low-pollutant machines, but also agricultural aggregates meant to maintain and improve the soil structure.

Agromarketing does not focus only on short-term concerns about company competence, but it is also a lever of general improvement, management of economic processes, cost-efficient organization of long-term production and distribution activities, with the purpose of determining whether this activity is carried out with maximum efficiency and practical input [1] (Alecu I.N., Merce E., Pană D., Sâmbotin L., Ciurea I.V., Bold I., Dobrescu N., 2001).

At S.C. AGRAR - M SERV. S.R.L. company, based in LIŞCOTEANCA, for the last 4 years, the grain maize has had a share ranging from 39.2% (in 2014) and 48.8 % (in 2012), with

an average for the analysed period of 42.6 % (Fig. 1).

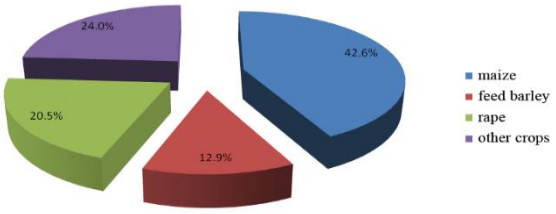


Fig.1. The structure of the main crops cultivated areas of S.C. AGRAR-M SERV. S.R.L. LIŞCOTEANCA, Brăila County 2012-2015 average.
Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

Feed barley is the second grain, after maize used, for animal feed. However, the evolution of the cultivated areas and productions achieved, both worldwide and in Romania, showed a rather high variance index, although the sales price was generally at the same level as maize price. It is worth mentioning that the supply of feed barley worldwide was relatively stable due to the large existing stocks, which led to an increase in the consumption of feed barley, also determined by its advantage, which can be a substitute for other cereals used in animal feed. In fact, FAPRI forecasts show an apparent increase in feed barely consumption of about 1 million tonnes per year from about 144 million tonnes in the 2008/2009 agricultural year to about 154 million tonnes in the 2018/2019 agricultural year. In Romania, the phenomenon was on the opposite, meaning that, due to the drastic reduction of livestock (especially pigs and poultry), the consumption demand for feed barley had a downward trend, both in terms of the cultivated area and production, correlated with low resistance of autumn barley to low winter temperatures.
At S.C. AGRAR - M SERV S.R.L. company, based in Bordei-Verde Commune, Lişcoteanca Village, Brăila County, the feed barley crop had a positive evolution, with an ascending trend, ranging between 9.8% (in 2012) and 16.0% (in 2015), and an average of the period 2012-2015 of 12.9% (Table 1, Fig.1).

Rape in edible oil production ranks 5th worldwide, with about 27 million hectares cultivated, of which 72.8% in China, India and Canada.
In Europe, the largest areas are cultivated in Germany, France, the UK and Poland (13.6% of the world total).
Romania cultivates annually about 500,000 hectares of rape, and the figures tend to go upwards, as a result of the fact that it is one of the most profitable plants, so that after 1990 the demand for biodiesel has increased, as biodiesel is considered the best fuel [15] (Guțu Oana-Adina et al., 2005).
Rape is also grown very early as a green feed [17] (Magazin P. et al., 1995). It is also a good melliferous plant, and from one hectare of rape it is possible to collect 80-90 kg of honey, which is recommended for kidney diseases [16] (Lup A., Apetroaie Camelia, 1997).

Table 1. The evolution of the areas cultivated with maize, feed barley and rape of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County, during 2012-2015

Year	Crops	Surface (ha)	% of arable land
2012	Maize	210	48.8
	Feed barley	42	9.8
	Rape	49	11.4
	Other crops	129	30.0
	Total arable	430	**100.0**
2013	Grain corn	195	42.9
	Feed barley	50	11.0
	Rape	85	18.7
	Other cultures	125	27.4
	Total arable	455	**100.0**
2014	Maize	190	39.2
	Feed barley	70	14.4
	Rape	110	22.7
	Other crops	115	23.7
	Total arable	485	**100.0**
2015	Maize	200	40.0
	Feed barley	80	16.0
	Rape	140	28.0
	Other crops	80	16.0
	Total arable	500	**100.0**
Average (2012-2015)	**Maize**	**198.75**	**42.6**
	Feed barley	**60.50**	**12.9**
	Rape	**96.00**	**20.5**
	Other crops	**112.25**	**24.0**
	Total arable	**467.5**	**100.0**

Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County.

At S.C. AGRAR - M SERV. S.R.L. company, based in Bordei-Verde Commune, Lişcoteanca Village, Brăila County, during the period under review, rape had a fairly small share, which averaged 20.5%, with increasing variation limits, ranging from

28.0% (maximum value in 2014) and 11.4 % (minimum value in 2012) (Table 1).

The analysis of the average production per hectare for the three crops shows the following (Table 2, Fig. 2).

-In grain maize, for the four years under review, the average production was 9,076 kg/ha, with the highest value recorded in 2014 (10,650 kg/ha) and the lowest value in 2015 (7,980 kg /ha;

-In feed barley, the average production over the period under review was 7,559 kg/ha with a relatively low variation index: + 11.1 % (in 2014) and - 9,7 % (in 2015);

-In rape, compared to 3,694 kg/ha (average of the period), in 2014 the growth rate was 506 kg/ha (+13.6%), while in 2015 the average production was 414 kg/ha (- 11.2 %).

Differentiation of average production per hectare is explained by the influence of climatic conditions *(rainfall, temperature, winds etc.)* in 2014, as a result of more favourable conditions compared to 2015, when the lack of rainfall led to the decrease of average yields per hectare, especially for grain maize.

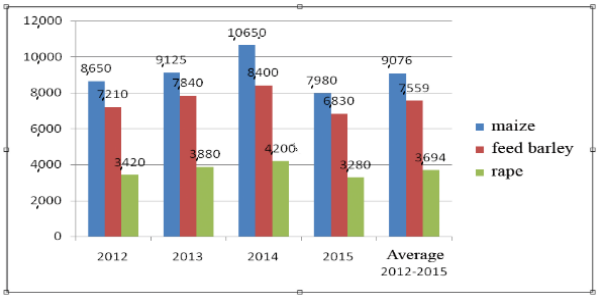


Fig. 2. The evolution of the average production per hectare for maize, feed barley and rape of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County, during 2012-2015 (tons)
Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

The evolution of total production in the three crops under review was influenced directly by two factors, namely: the cultivated surface and the average production per hectare (Table 2, Fig.3).

The largest total production of grain maize was registered in 2014, even though the cultivated area decreased by 9.5% compared to 2012. In this case, the average production per hectare had a positive influence. In 2015, the value of total production was minimum, even though the cultivated area increased by 5.3% compared to the previous year.

Table 2. The evolution of the average production per hectare and the total production for maize, feed barley and rape of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County, during 2012-2015

Year	Crops	Average production (Kg/ha)	Total production (tons)
2012	Maize	8,650	1,816.5
	Feed barley	7,210	302.8
	Rape	3,420	167.6
2013	Maize	9,125	1,779.4
	Feed barley	7,840	392.0
	Rape	3,880	329.8
2014	Maize	10,650	2,023.5
	Feed barley	8,400	588.0
	Rape	4200	462.0
2015	Maize	7,980	1,596.0
	Feed barley	6,830	546.4
	Rape	3280	459.2
Average (2012-2015)	**Maize**	**9,076**	**1,803.9**
	Feed barley	**7,559**	**457.3**
	Rape	**3,694**	**354.7**

Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County.

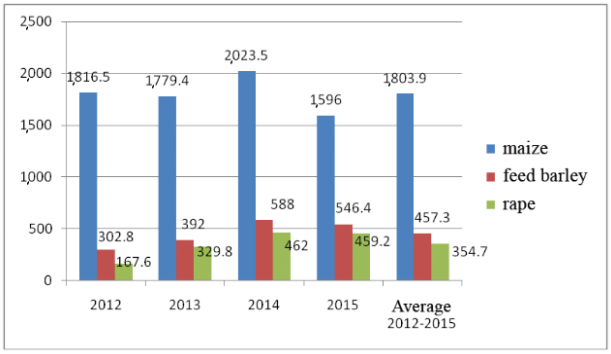


Fig. 3. The evolution of the total production for maize, feed barley and rape of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County, during 2012-2015 (tons)
Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

In the other cultures, evolutions were similar.

Thus, in 2014, **the feed barley** had the highest total production, both in terms of the average yield per hectare and the cultivated area having a positive influence compared to the reference year 2014.

For rape crops, in the last two years, total yields were virtually equal (-2.8 tonnes in 2015 compared to 2014), with the highest influence from cultivated area, which in 2015 was 27.3% higher compared to 2014 and 2.9 times higher compared to 2012.

At S.C. AGRAR - M SERV. S.R.L. company, based in Bordei-Verde Commune, Lişcoteanca Village, Brăila County, for all three analysed crops, the entire production achieved is intended for sale. The company complies with the marketing standards referred to in the Council Directive no. 66/402/EEC and Order no. 1262 on the rules and technical standards on production for marketing, quality control and certification.

The market for the sale of production is exclusively the domestic market. Beneficiaries are permanent customers, with whom relationships have been strengthened over time, due to the seriousness and confidence they have shown. The sold production is taken over by the beneficiaries with their own means of transport, under a local farm or storage scheme, on a contract basis, without intermediaries.

Beneficiaries with the highest weight are: S.C. SEROMGAL S.R.L., Galaţi; S.C. AGRIMAT Matca, Matca Commune, Galaţi County; S.C. Prutul S.A., Galaţi;

An especially important issue is related to establishing the sale price, which is based on quality, demand and competition. That is why prices are based on the negotiation process between the parties, which means that the company needs to set a price that will ensure it a certain market share that ultimately covers the total production and sales costs and generates a profit.

In order for the pricing decision to be properly substantiated, it is recommended to go through several stages:

-*Target market analysis* [8] *(*Chiran A., Gîndu Elena, Ciubotaru Adina, 2004)*;*

-*Analysis of the economic factors influencing the price* [6] *(*Chiran, A. et al. 1999)*;*

-*Setting goals to be achieved by the price set* [11] *(*Constantin M. et al., 2008)*;*

-*Choosing a price strategy* [5] (Cojoc Doina, Ignat Gabriela, 1999)*;*

-*Establishing the basic price and adapting it from time to time* [9] *(*Chiran A., Ciurea I.V., Gîndu Elena, Ignat Gabriela, 2006).

-Pricing is also marked by the wide diversity of product delivery conditions, local business practices, restrictions imposed by certain legal provisions, etc [13] (Gîndu Elena, Chiran A., Jităreanu A.F., 2014).

-Various price variations have recently taken place as a result of the ratio between the prices of certain products and the diversification of prices across different market categories [19] (Vainer A., 2000). In this respect, a marketing-oriented agricultural holding and/or agribusiness should closely monitor market prices, identify trends and anticipate possible evolution in order to achieve the best possible marketing [20] (Zahiu Letitia, 1999).

-Often, a high price is associated with a high quality product, which may be a reason to attract consumers with high financial strength [7] (Chiran A., Gîndu Elena, 1999).

-Also, a lower price may cause consumers not to purchase that product, suggesting that it is of an inferior quality [18] (Pekar V., 1995).

-If a company has several products within a line, the price will be set to maximize sales or profit across the portfolio [14] (Gîndu Elena, Andrei Ioana, 2006).

-The base price level (list price) is not fixed (rigid), as there is the possibility of temporarily adjusting it, depending on market pressures due to changes in the market, customers and competition. The minimum price will be determined by the cost of production, while the maximum price will be determined by the quality of the product.

-During the period under review, at S.C. AGRAR-M SERV. LLC Lişcoteanca, Brăila County, selling prices had an oscillating evolution (Table 3, Fig. 4).

Table 3. The evolution of sale prices for maize, feed barley and rape of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County, during 2012-2015 (lei/kg)

Crops	2012	2013	2014	2015	Average
Maize	0.60	0.55	0.52	0.65	0.576
Feed barley	0.65	0.62	0.54	0.58	0.587
Rape	1.40	1.25	1.30	1.35	1.316

Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

Thus, for grain maize, the maximum selling price was recorded in 2015, and the minimum level was recorded in 2014.

In feed barley, the 2015 evolution of the sales price showed a downward trend compared to 2012, as it was 21.5% lower.
Also in **rape** the sales price was characterized by a downward trend compared to the reference year (2012), with the lowest selling price in 2013, when the cut was 10.7%.
The level of sales prices has been influenced by several factors such as: relatively fluctuating offer; unstable short-term and medium-term demand; adverse climatic conditions; imports at advantageous prices; product quality and market share; advertising methods and techniques; destination of the products; price policy; inflation rate, etc.

Fig. 4. The evolution of sale prices for maize, feed barley and rape of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County, during 2012-2015 (lei/kg)
Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

Production costs are an essential tool for the activity of agricultural holdings as they fall under the Liabilities item in the Balance Sheet, showing the consumption of material goods and labour required to obtain a product, work or service. The possibility of obtaining a certain profit depends directly on production costs.
In the case of the analysed unit, the evolution of the total production costs was influenced by several factors, the first of which consisted of the cultivated area and the used technology (Fig. 5).
On average over the period 2012-2014, the production costs per hectare have been disaggregated by the three crops analysed (Table 4).
Thus, on the average over the four analysed years, the highest costs per hectare were recorded for maize grain **(**2,999 Lei/ha), while for feed barley, costs per hectare were lower by 26.9% (minimum), and in rape by 12.0% (2,640 Lei/ha).

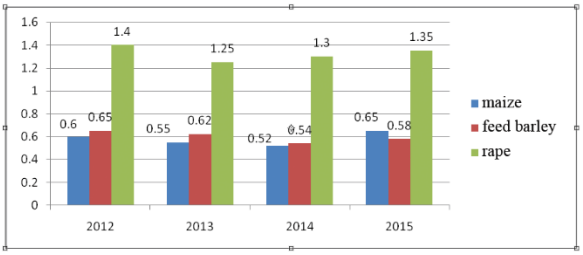


Fig. 5. The evolution of the unit cost for maize, feed barley and rape of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County, during 2012-2015 (lei/kg)
Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

Costs incurred to obtain an income of Lei 1,000 represent an indicator of the efficiency of their use in the production process of agricultural and/or agri-food businesses.

Table 4. The evolution of total costs, unit costs and expenditures per 1000 lei revenues realized by S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County, during 2012-2015

Year	Crops	Production costs lei/ha	Total production costs (thousand lei)	Unit costs lei/Kg	Expenditures at 1000 lei revenues
2012	**Maize**	2975	624.75	0.344	573.3
	Feed barley	2,134	89.63	0.296	455.4
	Rape	2,677	131.17	0.783	559.3
2013	**Maize**	3,110	606.45	0.341	620.0
	Feed barley	1,985	99.25	0.253	408.1
	Rape	2,710	230.35	0.698	558.4
2014	**Maize**	3,068	582.92	0.288	553.8
	Feed barley	2,210	154.7	0.263	487.0
	Rape	2,538	279.18	0.604	464.6
2015	**Maize**	2,852	570.4	0.357	549.2
	Feed barley	2,340	187.2	0.343	591.4
	Rape	2,660	372.4	0.811	600.7
Average	**Maize**	2,999	596.13	0.331	573.4
	Feed barley	2,193	132.7	0.290	494.0
	Rape	2,640	253.4	0.714	542.7

Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

Depending on this indicator, on average during the analysed period, the three cultures ranked as follows
1st place - feed barley, costs of Lei 494/income of Lei 1,000;

2nd place - rape, costs of Lei 542.7/income of Lei 1,000;
-3rd - grain maize, costs of Lei 573.4/income of Lei 1,000.
Total income is directly influenced by the sales price and the amount of goods production. The analysis of the calculated data revealed that the highest income was obtained from grain maize, with a variation amplitude ranging from 978.7 thousand Lei (minimum) in 2013 and 1,089.9 thousand Lei (maximum) in 2012, with an average for the period of 1,039.6 thousand Lei (Fig. 6).
In feed barley, the highest income was recorded in the last two years (317.5 - 316.9 thousand Lei), and in 2012 the income was minimal (196.8 thousand Lei).
Total revenues from **rape** in 2015 reached 619.9 thousand Lei (maximum), while the lowest income was obtained in 2012 (234.6 thousand Lei), when the area cultivated was the smallest.

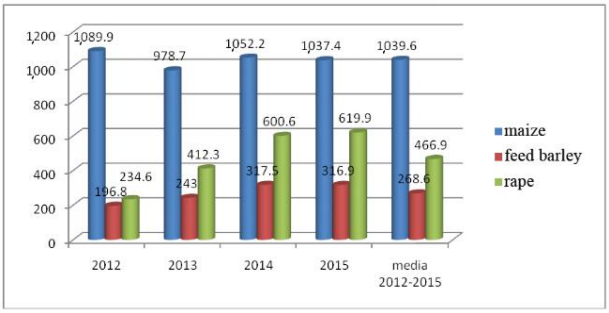


Fig. 6. The evolution of total revenues for maize, feed barley and rape realized by S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County, during 2012-2015
Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

The capacity of an agricultural or agri-food business can be analysed also on the basis of a certain profit at the end of the financial year, namely by assessing the use of production costs and costs of selling the production achieved and intended for sale outside the establishment.
In the system of market economy, the sale of production is a factor of growth and economic development of agriculture, a tool which must be prepared from the moment of programming production and its destination, by taking the appropriate technical, economic and management measures. In addition to these measures, one must also appropriate the art of selling so as to ensure a successful capitalization, which can be demonstrated by increasing the amount of the gross profit achieved (Fig. 7).

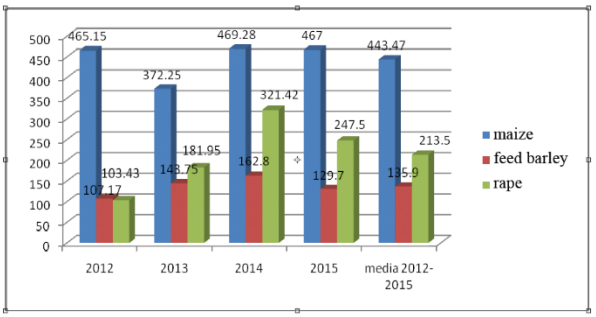


Fig. 7. The evolution of total gross profit achieved in grain maize, feed barley and rape at S.C. AGRAR-M SERV. LLC Lişcoteanca, Brăila County, throughout the period 2012-2015
Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

At S.C. AGRAR-M SERV. S.R.L. Company of Lişcoteanca, Brăila, in the period under review, the highest gross profit was recorded for grain maize, which also occupied the largest area.
In terms of area, we can see that, on average, the three crops are as follows, with a very small difference between them:
1st place - feed barley crops with a gross profit of 2,246 Lei/ha;
2nd place - grain maize crops, with a gross profit of 2,231 Lei/ha [with a difference of - 15 lei/ha (- 0.66%)];
3rd place - rape crops, with a gross profit of 2,224 Lei/ha [with a difference of - 22 lei/ha (- 0.98 %)].
The efficiency of using production costs keeps feed barley on the first place, at a rate of return of 102.4% (Fig. 8), while rape is on the second place, with a rate of return of 84.26%, and maize on the third place, with a rate of return of 74.4%.
More importantly, overall, the average rate of return was 80.72%, demonstrating that both the technical and technological elements and the management system for the capitalization of the goods production contributed to the

achievement of some outstanding results, proven by the fact that, at an average cost per hectare of 21 million Lei, the turnover reached 38 million Lei, which means that a cost of 1 Leu resulted in 1.81 Lei, that is 0.81 Lei/1 Leu spent.

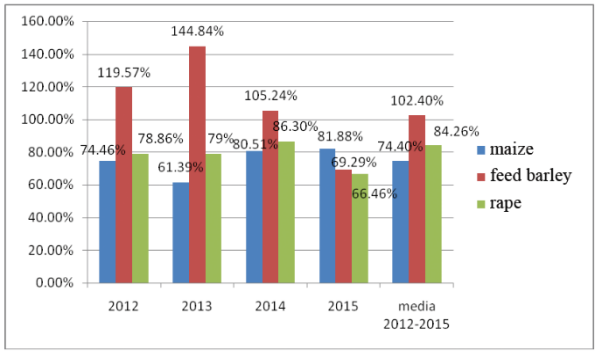


Fig. 8. The evolution of the rate of profitability achieved for grain maize, feed barley and rape at S.C. AGRAR-M SERV. LLC Lişcoteanca, Brăila County, throughout the period 2012-2015
Source: according to primary records of S.C. AGRAR-M SERV. LLC LIŞCOTEANCA, Braila County

The distribution of agricultural and/or agri-food products involves development of policies and strategies aimed at establishing marketing channels for the transport of products from production to consumption under economic efficiency conditions**.**

Distribution involves several steps, such as: *production stage, shipping stage, wholesale stage, retail stage, consumption stage.*

Physical distribution refers to both product flows *(transport, stocking, storing, prepacking, dispatching),* as well as information and monetary flows that contribute to its achievement.

In the case of *agricultural and/or agri-food products*, the distribution is extensive or general, specific to substitutable products currently demanded that meet an immediate and repeatable need. Under these circumstances, there must be a larger number of shops and points of sale where the products could be purchased by the final buyer. Different types of distribution channels can be used when one, two or several intermediaries are interposed between the producer and the consumer.

For perishable products, it is preferable to use direct distribution channels or short indirect channels to facilitate their transfer to consumers.

For products requiring pre-sale operations *(packing, prepacking, labelling)* a longer channel, such as the *manufacturer - wholesaler - retailer - consumer channel*, will be used.

The elements that influence the choice of the distribution strategy are numerous and depend on the company's commercial policy.

Choosing the right strategy is up to the manager in charge of fixing and tracking the use of the price as a means of achieving the fundamental objective, namely the highest profit.

The unit intends to create a website both in Romanian and English to make its products known and to become easier to notice, as this promotion method implies:

-The possibility of an optimal targeting meaning a high impact on the number of visitors;

-Low, almost insignificant cost;

-Easier provision of detailed specialized information to those interested;

-Practically unlimited flexibility in terms of approach.

This type of promotion is appropriate for higher value agricultural products and services intended for all customers, in general, to those who are open to new, but especially to other large companies operating as suppliers or potential partners and buyers.

CONCLUSIONS

S.C. AGRAR - M SERV. SRL Company of Lişcoteanca, Brăila County has its registered office in Bordei Verde Commune, Lişcoteanca Village, and was founded in 1995 as a limited liability company with a business object consisting of field crops growing, supply of raw materials and consumables, spare parts, etc., provision of services, distribution and capitalization of agricultural production.

Soil and climatic conditions are favourable for the cultivation of plants, as the location of the

unit is in the Northern Bărăgan Plain, known in the literature as "Brăila Plain", with a temperate continental climate, a drought area which requires irrigation of crops.

The crop structure consists of four crops (wheat, maize, feed barley and rape), of which the largest share is that of grain maize (42.6%) (on average for the four years under review), followed by wheat (24.0%), rape (20.5%) and barley (12.9%).

In the period under review, the average production per hectare was quite good: 9,076 Kg for corn, 7,559 for feed barley and 3,694 for rape.

The unit has achieved its basic objective, meaning that all crops have been profitable, with a gross profit per hectare that was insignificantly different from one crop to another (average of the period under review): Lei 2,246 for feed barley, Lei 2,231 for grain maize and Lei 2,224 for rape.

The production was capitalized on the basis of a short circuit (manufacturer -wholesaler) - a local farm or supplier warehouse, under a sale and purchase contract.

Achieving superior technical and economic results should be based on optimizing the process flow by groups of activities and, at the same time, on an efficient management and marketing, so that the managing and the operational staff could work closely together.

8. It is recommended to work closely with the Agricultural Research Centre in Brăila or Fundulea to inform and apply novelties that can contribute to increased production and economic efficiency.

REFERENCES

[1]Alecu, I.N., Merce, E., Pan, D., Sâmbotin, L., Ciure, I.V., Bold, I., Dobrescu, N., 2001, Management of agricultural holdings, Ceres Publishing House, Bucharest, Romania, pp.102-110.

[2]Axinte, M., Roman, Gh. V., Borcean, I., Muntean, L.S., 2006, Fitotehnie, "Ion Ionescu de la Brad" Publishing House, Iaşi, Romania, pp.34-36.

[3]Bold, I., Crăciun, A., 1995, Agricultural exploitation - organization, development, exploitation, Mirton Publishing House, Timişoara, Romania, pp. 58-61.

[4]Chiran, A., Magazin, P., Caia, A., 1995, The economic efficiency of the main agricultural crops by applied forms of ownership and technologies, Scientific papers, Agronomy series, Iaşi, Vol. 38, ISSN 0379-8364, pp. 282-289.

[5]Cojoc, D., Ignat, G., 1999, Accounting - Course - Lithographed, UASVM Iaşi, Romania, pp. 42-49.

[6]Chiran, A., Gîndu, E., Ştefan, G., Lokar A., Doga V, 1999, Agromarketing, Evrika Publishing, Chisinau, Republic of Moldova, pp. 250-275.

[7]Chiran, A., Gîndu, E., 1999, Theoretical considerations concerning the establishing, policies and strategies of prices within the Market economy, Scientific papers, U.A.M.V. Iasi, Agronomy series, Vol. 42, Vol. I, Romania, pp. 484-493.

[8]Chiran, A., Gîndu, E., Ciubotaru, A., 2004, The agricultural and agri-food market, Ceres Publishing House, Bucharest, Romania, pp. 69-73.

[9]Chiran, A., Ciurea, I.V., Gîndu, E., Ignat, G., 2006, Management, Marketing and Economic Management, Performantica Publishing House, Iaşi, Romania, pp. 84-90.

[10]Chirouze, Y., 1986, La distribution, radioscopie des cirants de distribution en France, Chotard et Associes Publishing House, Bologna, Italy, pp. 25-33.

[11]Constantin, M., Chiran, A., Funar, S., 2008, Marketing of agri-food production, AgroTehnica Publishing House, Bucharest, Romania, pp. 76-80.

[12]Dona, I., 2000, Roural economy, Economica Publishing House, Bucharest, Romania, pp. 41-56.

[13]Gîndu, E., Chiran, A., Jităreanu, A.F., 2014, Agrimarketing, PIM Publishing House, Iaşi, Romania, pp. 51-58.

[14]Gîndu, E., Andrei, I., 2006, Marketing - organization, strategies, decisions, consumer behavior, Tehnopress Publishing House, Iaşi, Romania, pp. 19-26.

[15]Guţu, O.-A., Banu A., Guţu R.F., Gîndu E., Chiran A., 2005, Optimizing the structure of cereal crops in the Southern area of Prahova county, Scientific papers, Agronomy series, Iasi, Vol. 48, ISSN 1454-7414, pp. 315-319.

[16]Lup, A., Apetroaie, C., 1997, Economy and management of agricultural holdings, Europolis Publishing House, Constanţa, Romania, pp. 39-47.

[17]Magazin, P., Chiran, A., Caea, A., 1994, Optimization of the crop structure, way to increase the economic efficiency of the vegetal production, Scientific papers Agronomy series, Iasi, Vol. 37, pp. 379-383.

[18]Pekar, V., 1995, Marketing strategies, Sedcom Libris Publishing House, Iaşi, Romania, pp. 56-64.

[19]Vainer, A., 2000, Elaboration of Sales Promotion Plans and Implementation, Marketing Management Magazine, No. 4, pp. 49-65, Bucharest, Romania.

[20]Zahiu, L., 1999, Agricultural Management, Economic Publishing House, Bucharest, Romania, pp. 25-38.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

TULCEA COUNTY - LATENT AGRITOURISM POTENTIAL

Ancuța MARIN

Research Institute for the Economy of Agriculture and Rural Development, 61 Marasti Blvd, District 1, Bucharest, Romania, Email: marin.ancuta@iceadr.ro

Corresponding author: marin.ancuta@iceadr.ro

Abstract

This paper intends to present the concrete situation in the South East Region of Romania, respectively in Tulcea County. In this paper it is presented data about the structure of the population, by ethnicity and gender, on the residence environment, distribution by age group, the accommodation units structure and the number of Romanian and foreign tourists who has visited the studied county. The development of agritourism in the area is laid in this paper, in close connection with the physical-geographic framework, the tourist objectives in the area and implicitly its economic development. National Institute of Statistics data were used and processed according to the objectives of the paper. The paper is finalized with a SWOT analysis that sets out conclusions and tries to be the reason why an investor would set up an agro-tourist hostel in the area taking advantage of the rare natural beauty and offering somewhat unusual accommodation conditions - but warm and welcoming - more especially for foreign tourists

Key words**:** *agrotourism, agrotourism boarding houses, tourists, macroregion, Romania*

INTRODUCTION

The rural tourism phenomenon is not a new one. "The desire to expand and spend leisure time and holiday in the country is a preoccupation, especially of the nature enthusiasts. New is how this form of tourism evolved both quantitatively and qualitatively in the last decades, and it tends to become a mass phenomenon" [2].

This type of tourism has as a specificity its development in a particular natural environment, including a large variety of activities such as: various sport competitions and events, festivals and other cultural activities related to traditions, many types of units with accommodation function suitable to the tourists' preferences and their budget alooted for travel. „It is a concept that encompasses the tourism activity organized and managed by the local rural population and which is based on a close connection with the natural and human environment" [5].

Taking into account that the local population employed in the agricultural sector was deeply affected by the economic crisis, agrotourism has become an opportunity for professional reconversion in order to obtain profit with minimal investments, using the already existing infrastructure. „But equally true is that agrotourism can be a good opportunity to make a business and for those who, tired of the stressful life of the city and willing to make a change, may be interested in the idea of moving to the country, along with their own family, to work the land and provide hospitality to tourists" [7].

„In terms of entertainment, agritourism is a form of tourism with a wide variety and uniqueness in delivering services to people who love nature, culture and peasant art" [3].

Being located in the south-eastern extremity of the country, in Dobrogea region, Tulcea County is crossed by Parallel 45, being bordered to the north by the Danube River and to the east by the Black Sea. [8]. Having a surface of 8,499 square km that represents 3.5% of the total area of the whole country, Tulcea County comprises of 51 administrative-territorial units. There are 4 cities, 46 communes and the county residence, Tulcea City that accommodates one third from the county population. (Fig.1.).

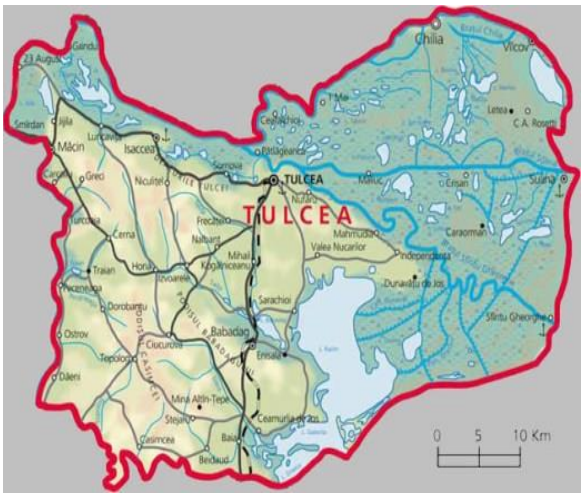


Fig.1.Tulcea County
Source: https://bit.ly/2RFP2OU

The territory of Tulcea County is the oldest and most complex of Romania's land plots. Its altitude is maintained between 100 m in the central part and 467 m at the highest peak in the north. The plateau has a varied geological composition from the green shale, dating from the beginning of the Paleozoic to the neogene formations and the quaternary loess that covers all the others. The area of the county comprises two well-defined physical-geographic units: Horst Dobrogean and Danube Delta. Dobrogean Horst is characterized as a typical plateau relief, having characteristic features: Măcinului Mountains, Niculițel Plateau, Babadag Plateau, Casimcea Plateau and Tulcea Hills. This relief determines the existence of 3 biogeographical areas (steppe, silvostepa and forest). Steppe fund is the most typical bio-geographic unit of the county. Silvostepa and forests develop on more restricted portions.

The second physical-geographic unit of Tulcea County, the Danube Delta is an alluvial plain in full swing and represents the youngest accumulation relief in our country, to which the rivers and the sea participated and participate equally.

According to the 2011 census, the ethnic composition of the Tulcea County population consists of 17 different groups, summing 213,083 people, out of which: 180,496 persons (84%) of Romanian ethnicity and 32,587 (16%) of other ethnicity, most representative ethnic groups being:

-Russians and Lipovans - 10,342 people (4.85%)
-Rroma – 3,423 people (1.6%)
-Turks and Tatars - 1,793 people (0.84%)
-Greeks - 1,181 people (0.55%)
-Ukrainians - 1,083 persons (0.50%) (Table 1).

Table 1. Population structure by ethnicity and gender (thousand people)

	Romanians	Russians and Lipovans	Rroma	Turks and Tatars	Greeks	Ukrainians	Other nationalities	TOTAL
	180.5	**10.3**	**3.4**	**1.8**	**1.2**	**1.1**	**14.8**	**213.1**
M	90.3	5.0	1.8	0.9	0.6	0.6	7.0	106.2
F	90.2	5.3	1.6	0.9	0.6	0.5	7.8	106.9

Source: NIS data processing.

According to the number of inhabitants per unit area, the density of inhabitants / square km is the lowest in the country, being only 25.07 inhabitants / square km, compared to the average of 84.4 inhabitants / square km per country. The low population density is explained by the fact that the Danube Delta and the lagoon complex Razim-Sinoe occupy an area of 3.446 sq. Km, which represents 40% of the area of the analyzed area.

At the end of 2017, the number of unemployed [6] was 3,951 persons, of which: 1,027 in the urban area, of which 330 women. In the rural area, there were 2,924 persons of which 1,160 women (Fig.1). The unemployment rate at December 31st, 2017 was 4.70%.

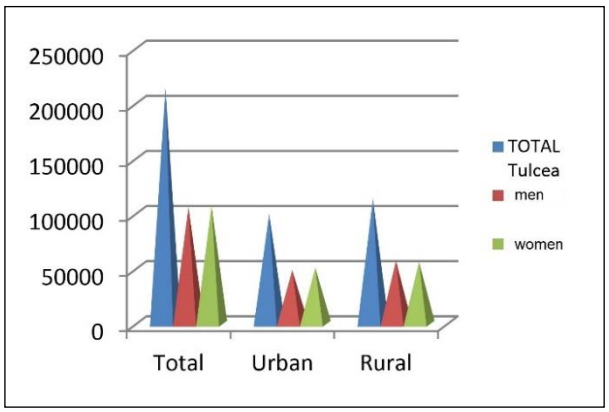


Fig.1. Structure of the unemployed by residence area and gender
Source: own data processing.

According to the census data from 2011, the population of Tulcea County has the following structure by age group (Fig. 2):

0-5 years - 10,908 people (5.11%)
6-9 years - 11,650 persons (5.46%)
10-14 years - 12,053 persons (5.65%)
15-19 years - 11,172 persons (5.24%)
20-64 years - 133,713 people (62,75%)
Over 65 years - 33,587 people (15.79%)

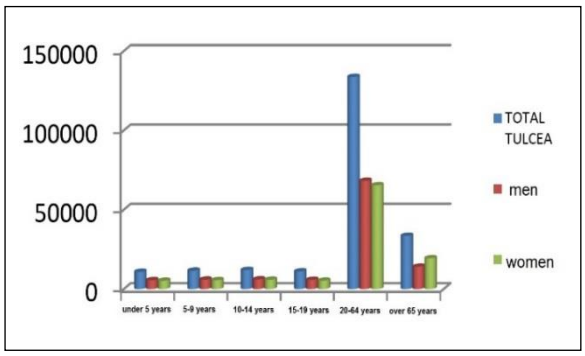


Fig.2. Population structure by age groups
Source: own data processing.

The poverty rate at the level of the Southeast Development Region experienced an average increase of 1.55 percent from year to year in 2010-2016, with statistical data showing a poverty rate of 27.80% in 2010, 34% in 2014 and 31.20% in 2016 (Table 2).

Table 2. Poverty rate in the SE Region

	2010	2011	2012	2013	2014	2015	2016
Poverty rate [%]	27.80	29.20	31.90	32.20	34.00	32.40	31.20

Source: NIS 2010-2016.

From an occupational point of view, the local economy relies almost exclusively on the primary semi-subsistence sector. The active population in Tulcea County registered a maximum in 2012 (89,700 persons), decreasing continuously in the following years to the value of 84,100 registered in 2016 (Table 3).

Table 3. Structure of the active population in Tulcea County

	2010	2011	2012	2013	2014	2015	2016
TOTAL	87,200	84,900	89,700	88,100	87,300	85,600	84,100
Men	46,500	45,300	48,400	46,200	45,900	45,100	44,800
Women	40,700	39,600	41,300	41,900	41,400	40,500	39,300

Source: NIS 2010-2016.

Analyzing the population in terms of the structure of employees by economic activity, out of the 39,294 persons employed in Tulcea County, in 2010, only 3.06% worked in the field of tourism and agritourism. A relatively constant trend can be observed, during the analyzed period, with a minimum registered in 2013, when a value of just 2.83% persons were employed in the tourism and agriturism field. The maximum value of the percent of persons occupied in this field was 4% in 2015. Corroborating the data presented so far, we conclude that only "agritourism exploits the natural potential of the area, highlighting both the tourist attractions and the hospitality of the inhabitants, introducing into the economic circuit novelties such as landscape, hospitality, solicitude, geographic information, cultural-historical information, gastronomic, artistic, etc."[2].

MATERIALS AND METHODS

For the characterization of agro-tourism in Tulcea County, during the period from which the paper refers (2012-2016), indicators were selected and analyzed regarding the structure of accommodation units and its share. Also the share of foreing tourists versus Romanian tourists was one of the analized indicators. For this purpose, National Institute of Statistics data were used. To conclude on the issues concerned, the paper ends with SWOT analysis regarding the stage and the level of touristic and agrotouristic activities in the county.

RESULTS AND DISCUSSIONS

Rural tourism and agritourism have become particularly important in the last decade as more and more tourists come to settle in the homes of locals, attracted by the possibility of discovering the environment, changing the way of life, as well as sports activities in nature. The recreational offer in rural tourism is represented by horseback riding, pedestrian walking, cycling, fishing and hunting, tasting products specific to peasant cuisine.

Rural tourism is an exciting alternative, especially for teambuilding programs, for groups not exceeding 30 people because it offers a much wider range of entertainment such as campfire, outdoor grill, food flavour "home like", practicing various sports, excursions and hiking. As in all countries of the world, the economic crisis has also affected Romania. This has particularly affected the agricultural sector, with the population having to shift to other areas of activity. Various aspects are considered in the pursuit of regional development in Romania. The most important factors considered for the above purpose are related to the increase of the professionalism of the staff engaged in tourism services, the high efficiency use of the existing natural resources and, last but not least, the increase of the living standards of the inhabitants of this region.

The data regarding the numbre of units with accommodation function in Tulcea County have been selected from the N.I.S. [4] and then have been processed and designed in Fig. 3.

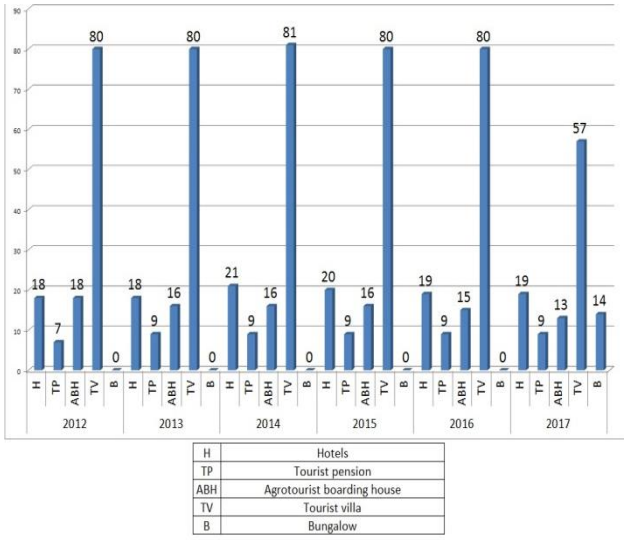


Fig.3.Number of accommodation units in Tulcea County
Source: own data processing.

The analysis of existing accommodation units in Tulcea county, shows the following:

-at the county level the highest share is the tourist villas (65%);

-the second place, in equal proportions of 14%, is the agro-tourist boarding houses and the hotels;

Starting from 2017, another type of accommodation units - the bungalows - are developing in Tulcea County by turning some tourist villas, representing 12% of the total units of accommodation (112).

In the analyzed period the number of tourists who visited Tulcea County ranged between 66,242 in 2014 and 100,430 tourists in 2017, refleceting a parabolic trend of variation.

More and more tourists like to visit Tulcea County and their numbre is unexpected high. The difference between the minimum and the maximum registered during the analyzed period was 34,188 tourists, that is 34% (Fig.4).

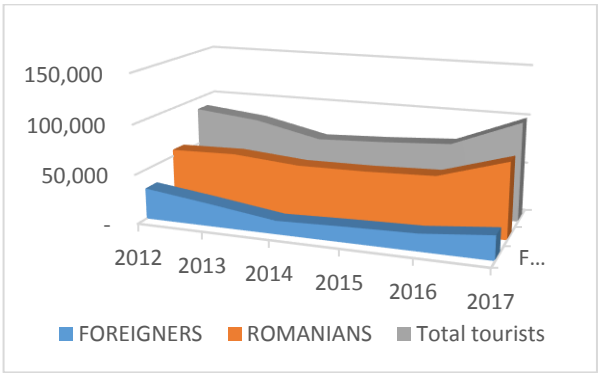


Fig.4.Number of Romanian and foreign tourists in Tulcea County
Source: own data processing.

As can be seen in Fig.4, the share of Romanian tourists varied between 64.44% in 2012 and 79.65% in 2014, the share of foreign tourists falling accordingly.

For business development, any investor needs to make a SWOT analysis of the situation. SWOT analysis is a research method used in the business environment to help design an overview of the company. It functions as a radiography of a company / ideas / business and assesses both the inside and outside determinants which have a high influence on it.

It also considers the position on the market or in relation to the competitors of the firm in order to highlight the strengths and weaknesses, opportunities and threats existing at a certain moment in the market. As a first

phase of a project, SWOT analysis is generally caried out in order to form the basis of the project plan and its purpose is to be used in the later phases of project development, if it has difficulties in terms of planning, deliverables or budget assigned and must be returned to the waterline. Assuming that some of the unoccupied persons in the county want to develop an activity in the field of agritourism they should consider the following:

Strengths:

-clean environment, due to its location in an unpolluted area;
-varied geological structure, which generated types of relief with a special tourist function;
-rich hydrographic network (the Danube and its tributaries);
-varied and rich vegetation and the presence of appropriate fauna;
-existence of the Danube Delta biosphere reserve;
-traditions and customs are spiritual continuity and further forward habits, technologies and various information, including historical;
-the culinary diversity of traditional cuisine;
-the existence of a developed network of tourist reception facilities;
-welcoming and hospitable hosts;
-the existence of unoccupied workforce that can be re-qualified in hospitality.

Weaknesses:

-lack of access roads in all areas of the county and poor maintenance of existing ones;
-Inter- and intra-county public transport is deficient, because there are few races, high waiting times and outdated conditions;
-the lack of an international airport for the access of foreign tourists who are increasingly interested in this tourist area;
-tourist attractions left to deteriorate;
-poor tourist information;

Opportunities:

-adapting existing accommodation structures to market requirements;
-major interest in the allocation of funds for the development and modernization of transport infrastructure;
-tourism development through European funding;
-increased interest in agritourism;
-the adoption at local level of norms for new constructions that can be executed according to the traditional type, thus the architectural style at the county level would have a constructive and decorative function;
-the existence of a minimal number of architectural models for "main street" constructions;
-the progressive functionality of traditional buildings, souvenir shops, exhibition halls;
-transfer of valuable objectives in the context of open-air museums;

Threats:

-the flow of tourists decreased due to the road infrastructure;
-the lack of promotional materials in international languages;
-tourism offers below the level of the international market;
-migrating locals into countries with a different standard of living and returning to them during holiday or definitive holidays strongly marked the typology of rural households by importing foreign architectural patterns into rural areas borrowed from Western countries, which led to the loss of authenticity of the area.

CONCLUSIONS

As a complementary solution to agricultural activities, agritourism can directly support the social and economic development of an area.

„Thus, agritourism was an opportunity for locals who are willing to try other activities to ensure their livelihood by receiving tourists in their homes" [1].

It can also be a good business for those living in big cities who want to give up stressful life in favor of the quiet rural environment. For those who love nature, art and peasant culture, agrotourism can provide services of great variety and uniqueness.

REFERENCES

[1]Agricultural Gazette, 2008, Agrotourism, a chance, in the current crisis in the agricultural sector, https://www.gazetadeagricultura.info/turism-rural-

agroturism/1930-agroturismul-o-sansa-in-criza-actuala-din-sectorul-agricol.html, Accessed on Jan.5th, 2019.
[2]Cretu, R.C., 2013, Management of Agrotouristic Resources, University Publishing House, Bucharest, pp. 27.
[3]Gheorghilaş, A., 2014, Geography of Tourism, University of Bucharest, Credis Publishing House, pdf file, www.unibuc.ro/prof/ene.../23_12_37_091_Geografia_Turismului.pdf, Accessed on Jan.5th, 2019.
[4]National Institute of Statistics, Tulcea regional site, , http://www.tulcea.insse.ro/main.php?id=469, Accessed on Jan.5th, 2019.
[5]Pota, M. M., 2010, Research on the agro-tourist potential of the Arad county forest area, PhD Thesis Summary, USAMV Timisoara, pp.9.
[6]Press release AJOFM TL, 2017, http://tulcea.accesibilitateajofm.ro/wp/wp-content/uploads/2018/01/Rata-somajului-in-judetul-Tulcea-decembrie-2017.pdf, Accessed on Jan.5th, 2019.
[7]Stanciulescu, G., Lupu, N., Ţigu, G., Titan, E., Stancioiu, F., 2002, Lexicon of touristic terms, Oscar Print Publishing House, Bucharest.
[8]Tulcea County, 2019, https://www.info-delta.ro/judetul-tulcea-13/, Accessed on Jan.5th, 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

E-TRAINING ON GREEN LOGISTICS IN THE AGRI-FOOD SECTOR

Catherine MARINAGI, Panagiotis TRIVELLAS, Petros KOFAKIS, Giannis T. TSOULFAS, Panagiotis REKLEITIS

Agricultural University of Athens, Iera Odos 75, GR11855, Athens, Greece, Emails: marinagi@aua.gr, ptrivel@aua.gr, kofakis@gmail.com, giannis@aua.gr, preklitis@aua.gr

Corresponding author: marinagi@aua.gr

Abstract

This paper aims to investigate the training requirements of diverse target groups engaged with logistics and supply chain management in the agri-food industry focusing on cereals and rice, and deploy the findings for the development of an e-training program. A field research was conducted with personal interviews to mainly logistics department supervisors of more than 150 firms, in order to detect gaps in their skills and competencies on the application of green practices in the agri-food supply chain. As a result, an e-training program was developed to support trainees to enhance their knowledge and skills in the field, and in turn to increase agri-food supply chain effectiveness and competitiveness. This paper also presents the curriculum content development, which was based on training needs analysis. The utilisation of the Moodle platform for the curriculum content building and the e-training program implementation and delivery, is also discussed.

Key words**:** *e-learning, e-training, green logistics, agri-food supply chains, cereals*

INTRODUCTION

The agricultural and food (agri-food) sector is proved to be a major contributor to EU economy. Current economic crisis has highlighted the need to strengthen agri-food supply chains, which are comprised of a series of operations from 'farm-to-fork' [4]. The application of green practices across the supply chain [12] is critical to the success of the agri-food sector.

For example, Iakovou, *et al*. [3] have proposed a framework for the design of sustainable agri-food supply chains, implementing appropriate green supply chain management and logistics principles.

Tsolakis, *et al.* [15] have identified a list of key issues for the design and management of modern agri-food supply chains that need to be addressed, as follows: selection of farming technologies, financial planning and investment, supply chain partners' relationships, quality management, performance management, risk management, sustainability, transparency, food safety & traceability, harvest planning, logistics operations, waste management & reverse logistics, as well as fleet management, vehicle planning & scheduling.

Many researchers have investigated the skills and competencies that are essential for logistics and supply chain management managers and employees. In particular, Murphy and Poist [9] suggested a widely adopted framework of three skills categories for Logistics and Supply Chain Managers (LSCM): business, logistics and management skills (BLM skills). For each of these three main categories, and especially for the technical logistics skills, other researchers proposed different views. For example, more recent studies focus on technological skills and technical LSCM knowledge [1,13,11,18].

Stakeholders in the agri-food supply chain need to obtain and/or improve appropriate skills and competencies via diverse training methods and techniques, during training programs. Such programs may use face-to-face learning, e-learning or blended learning approach (e.g. Laisi, *et al.* [5], Wu and Huang [17]). More specifically the e-learning approach has been successfully utilised for agricultural training, mainly because it offers remote accessibility, as stated by Leary and

Berge [6]. Moreover, e-learning has been used in the area of logistics (e.g. Laisi, *et al.* [5], Wu and Huang [17]).

Valsamidis, *et al.* [16] have proposed a framework for applying e-learning in agriculture that includes three stages: a) platform development, b) course development and delivery, and c) platform and courses evaluation. This framework can also be applied in agri-food LSCM training.

The work presented in this paper, is related with a project titled "Green Logistics e-Training in Cereal/Rice Sector", (Erasmus+, KA2, Strategic Partnerships for Vocational Education and Training). The project has been completed with the cooperation of four Euro-Mediterranean countries (Greece, Spain, Portugal, Cyprus) in 2018. The scope of the project was to develop and deliver a customized e-learning program to all interested stakeholders in the agri-food supply chain focusing on cereals and rice.

Training requirements surveys charting the current skills & competencies profiles of the logisticians in alignment with the best practices provided by the cereal and rice sector professionals, laid the foundation for the e-training program curriculum and content. In particular, previous work by Marinagi, *et al*, [7] and Trivellas *et al*, [14] presented the results of two field surveys. The first survey was conducted in order to diagnose the training needs on the primary sector of farming (young farmers, short food supply chain). The survey designated the necessity to cultivate skills on marketing, human resource management and strategic networking. The second survey, which was based on all stakeholders along the agri-food supply chain, revealed the gap between realized and desired profiles in skills and competencies related to logistics, business and management.

In this paper, we investigate the training requirements of the communities engaged with supply chain management in the agri-food sector, which are related with the application of green practices across the supply chain. Then, we present the implementation of a customized e-training program, called "Green Logistics in the agri-food sector". The program aims to support target communities to develop their knowledge and skills in the field, in order to increase their effectiveness and competitiveness.

The rest of the paper is organised as follows: Firstly, the methodology of research is discussed. Then the results of the training requirements analysis are stated and the e-training program curriculum based on these results is described. The e-training platform utilised for building the training content and delivering the e-training program follows. Finally, conclusions are discussed.

MATERIALS AND METHODS

A field research was conducted with personal interviews to supervisors of mainly logistics departments of firms in the agri-food sector, in order to map their training requirements regarding green practices. More than 150 Greek firms participated in the research.

Questionnaire Design

The survey technique consisted face-to-face interviews with key participants of the agriculture supply chain. The structured questionnaire was also available on the web (LimeSurvey), in order to facilitate the process of interviewing the potential participants as well as the process statistical analysis. In addition to face-to-face interviews, a number of self-administered (auto-compiled) questionnaires were gathered. Respondents were asked to rate the importance and the degree of realisation of each skill on a seven-point Likert scale, which provides increased measurement sensitivity and variance extraction. In particular, respondents firstly evaluated the importance of each of the green awareness' item (1: "not at all important" to 7:"very important") and, secondly, the implementation of each item (1: "not implemented at all" to 7:"very high implementation").

The content validity of the questionnaire (instrument) was established through an analytical pre-testing process [19]. During this process, the researchers visited several potential participants (farmers and agriculture

supply chain participants) and relevant academics. In total, ten unstructured interviews were taken. The interviewees were asked to comment on the level of difficulty and/or the lack of clarity of the items of the questionnaire, as well as the instructions provided. After the completion of that procedure, the proposed modifications were fully incorporated. Finally, the modified questionnaire was distributed to a small number of farmers, retailers, manufacturers in the agri-food supply chain, who were also asked to make their remarks.

Sampling

The field research was based on owners, supervisors, or managers in Greek firms along the agri-food supply chain. The research was conducted in 2017 in the regions of Attica and Viotia. Examining demographics, 31% of the respondents work in retailers, 15% work in transportation and logistics companies, 13% work in food processing, and 10% are farmers. The 36% of the sample are females. The 78.1% of the participants hold a managerial/supervisor position (supervisors, directors, managers). The average age of the respondents is almost 42 years with 15 years of work experience.

RESULTS AND DISCUSSIONS

Green Practices Awareness and Adoption

Regarding awareness and adoption (implementation) of green practices, respondents rank higher Eco-friendly behavior in everyday life (mean=5.27), and assessment of personal life footprint (mean=5.10), followed by green practices for physical environment protection (mean=5.06), while the lowest marks are on assessment of environmental impact (e.g. carbon/water footprint) (mean=4.38), awareness /informational initiatives & events for green practices (mean=4.43) and government policy/legislation on green logistics (mean=4.44). Besides, t-test analysis was used to asses the statistical significance of the differences between techniques' awareness and adoption ($p<0.05$). Results summarized in Table 1 indicate that the widest gap appear at assessment of environmental impact (e.g. carbon/water footprint) (15.7%, $p<0.001$), Green practices reducing water consumption (15.4%, $p<0.001$), Green practices for transportation/ logistics (15.3%, $p<0.001$), and Government policy/legislation on green logistics (15.2%, $p<0.001$).

Table 1. Green practices awareness & adoption

Green practices	Awareness	Adoption	Dif. %	Sig.
1. Government policy/legislation on environmental protection	5.14	4.66	10.2%	.05
2. Government policy/legislation on green logistics	5.12	4.44	**15.2%**	.05
3. Firm's Corporate Social Responsibility Strategy	5.35	4.79	11.6%	.05
4. Firm's policy/regulations on green logistics	5.28	4.65	13.5%	.05
5. Assessment of firm's green performance	5.15	4.58	12.5%	.05
6. Green standardization (e.g. ISO 14001, GRI guidelines)	5.21	4.63	12.5%	.05
7. Green practices for transportation/ logistics	5.29	4.59	**15.3%**	.05
8. Green technologies/practices reducing energy consumption	5.37	4.75	13.1%	.05
9. Green practices reducing water consumption	5.60	4.85	**15.4%**	.05
10. Green practices for physical environment protection	5.61	5.06	10.9%	.05
11. Awareness/informational initiatives & events for green practices	5.07	4.43	14.5%	.05
12. Assessment of environmental impact (e.g. carbon/water)	5.07	4.38	**15.7%**	.05
13. Eco-friendly behavior in everyday life	5.77	5.27	9.5%	.05
14. Assessment of personal life footprint	5.74	5.10	12.4%	.05

Source: Own results.

Performance Implications of Green Practices

In order to investigate the association between green practices, and effectiveness at the organisational and supply chain level, Pearson's correlation analysis was conducted. Table 2 presents the results, where all green practices are strongly related to performance at the organizational and supply chain level.

Table 2. Correlation analysis results for green practices

Green practices	Organizational Performance *	Supply Chain Effectiveness *
1. Government policy/legislation on environmental protection	.382	.311
2. Government policy/legislation on green logistics	.361	.286
3. Firm's Corporate Social Responsibility Strategy	.520	.508
4. Firm's policy/regulations on green logistics	.533	.487
5. Assessment of firm's green performance	.488	.449
6. Green standardization (e.g. ISO 14001, GRI guidelines)	.453	.442
7. Green practices for transportation/ logistics	.473	.432
8. Green technologies/practices reducing energy consumption	.448	.411
9. Green practices reducing water consumption	.417	.334
10. Green practices for physical environment protection	.495	.473
11. Awareness/informational initiatives & events for green practices	.473	.410
12. Assessment of environmental impact (e.g. carbon/water footprint)	.494	.378
13. Eco-friendly behavior in everyday life	.456	.447
14. Assessment of personal life footprint	.394	.339

Source: Own results.

Logistics, Business and Management Skills, and Green Performance/ Management

In order to investigate the association between BLM skills [9], and green performance, Pearson's correlation analysis was conducted. Table 3 presents the results, where all groups of skills & competencies are strongly related to green performance/management.

In particular, strategic logistics (logistics skills), and systems thinking skills (management skills), dominate among associations with green performance. Then, logistics information & integration (logistics skills), and warehouse management & ordering (logistics skills) are among the skills that are strongly related to green performance.

Inter-item analysis is used to verify competencies scale for internal consistency or reliability. Specifically, Cronbach's coefficient alpha is calculated for each sub-scale, as recommended by Flynn et al. [2], ranging from 0.74 to 0.89. Thus, all sub-scales exhibited well over the minimum acceptable reliability level of 0.7 [10].

Curriculum Content Development

The results presented above, were combined with previous findings on BLM skills and competencies gaps [7,14], in order to guide the development of the curriculum of the "Green Logistics in the agri-food sector" e-training program, which is provided in four languages (English, Greek, Spanish, and Portuguese).

In particular, wider divergences between realised and required skills were detected in the fields of green logistics, integrated logistics, and logistics information management/logistics software.

Table 3. Correlation analysis results

	mean	S.D.	Cronbach's alpha	Green Performance *
(A) Logistics skills				
L1.Strategic logistics	4.86	1.214	0.839	**0.470**
L2.Logistics information & integration	4.50	1.407	0.850	0.415
L3.Inbound logistics & safety	5.47	0.879	0.760	0.385
L4.Warehouse mgt & ordering	5.54	0.938	0.772	0.407
L5.Distribution management	5.13	1.131	0.753	0.334
(B) Business skills				
B1.Extrovert business network skills	4.52	1.206	0.918	0.332
B2.HR skills	5.20	0.908	0.740	0.309
B3.Strategic skills	5.27	0.986	0.834	0.301
B4.Quantitative skills	4.65	1.292	0.874	0.362
B5.Marketing & communication skills	4.70	1.296	0.821	0.319
(C) Managerial skills				
M1.General managerial abilities	5.12	0.991	0.936	0.371
M2.Emotional intelligence competencies	5.51	0.905	0.876	0.326
M3.Monitor skill	5.57	0.919	0.813	0.399
M4.Systems thinking skills	5.47	0.922	0.812	**0.448**
M5.Extrovert personality skills	5.13	1.071	0.817	0.232
Green performance	4.74	1.398	0.897	

[a] The Kaiser–Meyer–Olkin (KMO) indicator was calculated to assess sample size adequacy. The minimum acceptable level is 0.5. Bartlett's test of sphericity is significant at p<0.001 for all variables.
*All correlation coefficients are statistical significant at p<0.001

Source: Own results

Similarly, examining business competencies in training needs analysis for green agri-food supply chain skills, wider gaps were revealed in e-commerce, quality management and labor relationships. Concerning management skills, competencies promoting innovation and creativity proved to need improvement.

The curriculum is grouped in three distinct categories of skills and competencies, each of which corresponds to a different section: (A) Green logistics and operational skills in agri-food sector; (B) Organisational skills and competencies; and (C) Information and communication technologies. Each of the three sections includes a number of modules. Each module is an autonomous learning unit. The sections (A, B, C) and modules (M1-M13) are the following:

Section A. Green logistics and operational skills in agri-food sector

M1.Rice and cereal sector: an introduction
M2.Transportation and distribution
M3.Storage and warehousing
M4.Sustainable practices and new technologies
M5.Quality management in agri-food supply chain
M6.Vehicle routing

Section B. Organisational skills and competencies

M7.Human resources management
M8.Financial management
M9.Marketing - International trade
M10.Crisis management

Section C. Information and communication technologies

M11.Information and communication technologies in supply chain management:
M12.Electronic commerce
M13.Electronic government

Our research findings guided the curriculum content development. The green practices listed in Tables 1 and 2 have been considered during the creation of the content of all the modules of the e-training program. Furthermore, as demonstrated in Table 3, all groups of BLM skills & competencies are strongly related to green performance.

For example, the module 'M4. Sustainable practices and new technologies' focuses on sustainable development and the new technologies that facilitate it. Green practices for sustainability in the supply chain are included (see Table 1 and 2): Green

technologies/practices reducing energy consumption, Green practices reducing water consumption, Green practices for physical environment protection, Awareness/ informational initiatives & events for green practices, Assessment of environmental impact (e.g. carbon/water footprint), and Eco-friendly behavior in everyday life. Issues such as the reduction of routes and distances and the transport of dangerous goods are also addressed (see in Table 1 and 2: Green practices for transportation/ logistics). The module also includes green practices emerged from a previous survey, which diagnosed the training needs on the primary sector of farming. In particular, the module addresses issues such as the exploitation of by-products for energy consumption, fertilizer, and animal feed, the selection of socially responsible suppliers, the exploitation of precision agriculture and the adoption of supportive indicative technologies.

The content of each module may include various types of training material that support e-training, such as learning objectives, sources, scientific and professional–oriented documents, examples, case studies, exercises, multimedia files, self-assessment tests, examinations, recommendations for further reading etc. These types are considered when deciding the appropriate platform for the implementation of the e-training program.

The E-training Platform

The Moodle Learning Management System (LMS) [8], is an open source web-based platform, which has been employed for the development of the e-training program "Green logistics in the agri-food sector". The URL of the e-training program on Moodle platform is: http://green-logistics.teiste.gr /moodle.

In Figure 1, the homepage is presented, where the main sections of the curriculum appear in four languages. In Figure 2, an example of a module is shown (Storage and warehousing). The screenshot depicts the first part of the webpage of the module's training content. Content developers and trainers of the e-training program utilised Moodle's advanced tools for the creation, organisation and updating of the various types of training content that facilitate the e-training process.

In addition, Moodle enables trainees to access the training material remotely, study in their own schedule, engage in different module activities, assess their progress in each module through self-assessment tests, and participate to the final examination.

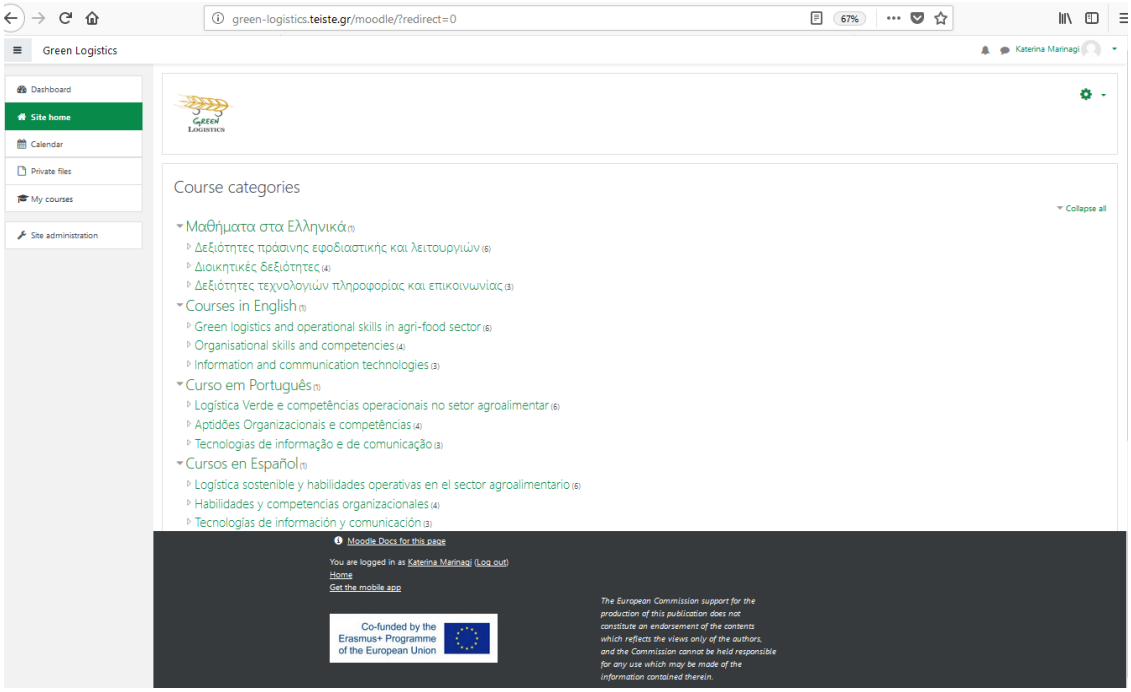


Fig. 1. The homepage of the e-training program
Source: http://green-logistics.teiste.gr/moodle

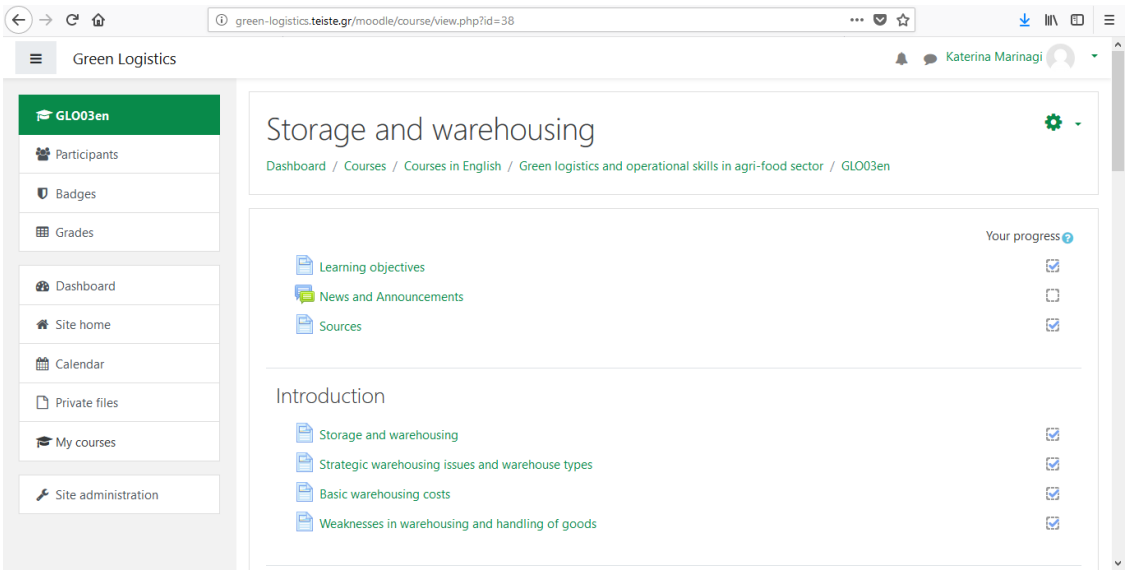


Fig. 2. A screenshot of the module "Storage and warehousing"
Source: http://green-logistics.teiste.gr/moodle/course/view.php?id=38

In Figure 2, the tick box to the right of each activity informs the trainee if it is completed or not. Moodle tools also facilitate the issue of an official certificate per trainee, only if they pass the final examination.

We have also utilised Moodle's collaborative tools such as discussion forums, chats, and e-mails to enable both trainee-to-trainee and trainee-to-trainer interaction.

Besides the provision of the tools mentioned above, Moodle LMS has been chosen because it is SCORM compliant, it is accessible across different web browsers and devices, it safeguards data security and user privacy, and provides documentation and user forums in multiple languages.

CONCLUSIONS

This paper presented a field survey that was conducted in order to investigate the training requirements of the target groups on the application of green practices across agri-food supply chains. The wider gaps between realised and required skills and competencies were detected in: assessment of environmental impact (e.g. carbon/water), green practices reducing water consumption, green practices for transportation/ logistics, and government policy/legislation on green logistics.

Statistical analysis investigating the association between green practices, and effectiveness at the organisational and supply chain level, revealed that all green practices are strongly related to performance at the organizational and supply chain level.

Similarly, examining the association between BLM skills [9], and green performance, revealed that all groups of skills & competencies are strongly related to green performance.

The synthesis these results with previous findings on BLM skills and competencies gaps of stakeholders in agri-food supply chains [7,14], guided the development of the curriculum content of the e-training program "Green Logistics in the agri-food sector".

Moreover, the utilisation of the Moodle LMS platform for the curriculum content creation and the e-training program implementation and delivery was discussed.

Future work includes focusing on green supply chains of other agricultural products, such as olive oil.

ACKNOWLEDGEMENTS

This research work was financed from Erasmus+ Programme, KA2, No. 2015-1-EL01-KA202-014015.

REFERENCES

[1]Flöthmann, C., Hoberg, K., Wieland, A., 2018, Competency requirements of supply chain planners &

analysts and personal preferences of hiring managers. Supply Chain Management: An International Journal, 23(6):480-499.
[2]Flynn, B.B., Sakakibara, S., Schroeder, R., Bates, K., Flynn, J., 1990, Empirical research methods in operations management, Journal of Operations Management, Vol. 9(2): 250-84.
[3]Iakovou, E., Vlachos, D., Achillas, Ch., Anastasiadis, F., 2014, Design of sustainable supply chains for the agri-food sector: a holistic research framework. Agricultural Engineering International: CIGR Journal Special issue 2014: Agri-food and biomass supply chains, 1-10. http://www.cigrjournal.org, Accessed on November 5, 2018.
[4]Jaffee, S., Siegel P., Andrews, C., 2010, Rapid agricultural supply chain risk assessment: a conceptual framework, Agriculture and Rural Development, Discussion Paper 47, The World Bank.
[5]Laisi, M., Hilmola, O-P., Korovyakovskiy, E., Simushkov, A., 2011, Utilising e-learning in Russian transport logistics sector. International Journal of Shipping and Transport Logistics, 3(2):210-226.
[6]Leary, J., Berge, Z.L., 2006, Trends and challenges of eLearning in national and international agricultural development. International Journal of Education and Development using Information and Communication Technology (IJEDICT), 2(2):51-59.
[7]Marinagi, C., Kofakis, P., Trivellas, P., Reklitis, P., 2018, Designing an e-training program on green logistics in rice and cereal sector. Proceedings of the 10th Annual International Conference on Education and new Learning Technologies (EDULEARN18*)*, 2-4 July, Palma Mallorca, Spain, 8094-8103, IATED Publications, https://library.iated.org/publications/ EDULEARN18/start/1200, Accessed on Dec.10, 2018.
[8]Moodle, 2018, Learning Management System. https://moodle.org/, Accessed on April 10, 2018.
[9]Murphy, P.R., Poist, R.F., 1991, Skill Requirements of Senior-level Logisticians: Practitioner Perspectives. International Journal of Physical Distribution & Logistics Management, 21(3): 3-14.
[10]Nunnally, J.C., Bernstein, I.H., 1994, Psychometric Theory, 3rd ed., McGraw-Hill, New York, NY.
[11]Sangka, K.B., 2017, A Competency Model for Operations Managers in Indonesia Third-Party Logistics (3PL) Providers. PhD Thesis, Business IT and Logistics, RMIT University, Melbourne, Australia.
[12]Srivastava, S.K., 2007, Green supply-chain management: a state-of-the-art literature review. International Journal of Management Reviews, 9(1): 53–80.
[13]Suttiwatnaruput, K., Pornchaiviseskul, P., Archiwaranguprok, S., 2014, Supply chain manager competencies and their impact on supply chain integration. European Journal of Logistics, Purchasing and Supply Chain Management, 2(1), 71-89.
[14]Trivellas, P., Reklitis, P., Marinagi, C., Tsoulfas, G., 2018, Examining Gaps in Business and Logistics Skills and Their Performance Implications in the Agrifood supply Chain in Greece, International Conference on Strategic Innovative Marketing and Tourism - ICSIMAT 2018, Voula, Greece, 17-20 October 2018.
[15]Tsolakis, N., Keramydas, C., Toka, A., Aidonis, D., Iakovou, E., 2012, Agri-food supply chain management: A comprehensive hierarchical decision-making framework and a critical taxonomy. The 2nd International Conference on Supply Chains (ICSC 2012), 5-6 Oct., Katerini, Greece.
[16]Valsamidis, S., Kazanidis, I., Petasakis, I., Karakos, A., 2011, A Framework for E-Learning in Agricultural Education, in M. Salampasis, A. Matopoulos (eds.): International Conference on Information and Communication Technologies for Sustainable Agri-production and Environment (HAICTA 2011), Skiathos, 8-11 September, 2011.
[17]Wu, Y.C., Huang, S.K., 2013, Making on-line logistics training sustainable through e-learning. Computers in Human Behavior, 29, 323–328.
[18]Young, L., 1998, Human element, Materials Management and Distribution, December, p. 27.
[19]Zikmund, W.G., 2003, Business Research Methods, Thomson/South-Western, Mason, OH.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

A STUDY ON THE ROMANIAN BIOTECH ENTREPRENEURS PROFILE AND CHALLENGES

Florentina MATEI[1], Flavia ANGHEL[1], Mihaela GHIDURUS PANAGOPULU[1], Mioara VARGA[1], Mihaela DRAGHICI[1], Cristina COCULESCU[2], Bogdan MATEI[1], Gabriel Eugen GARAIS[2], Radu Cristian TOMA[1]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Biotechnology, 59 Marasti Blvd, District 1, Bucharest, Romania, Emails: florentina.matei@biotehnologii.usamv.ro, mihaela_ghidurus@yahoo.com, vargamioara@yahoo.com, mihaeladraghici38@gmail.com, bogdanmatei70@gmail.com, radu.toma@biotehnologii.usamv.ro
[2]Romanian-American University, 1B Expozitiei Blvd., District 1, Bucharest, Romania, Emails: flavia.anghel@rau.ro, coculescu.cristina@profesor.rau.ro, garais.gabriel.eugen@profesor.rau.ro,

Corresponding author: florentina.matei@biotehnologii.usamv.ro

Abstract

The present study was trying to profile the Romanian Biotech Entrepreneur skills, knowledge and competencies adapted to the national environment in the European context. The study is based on a questionnaire survey applied on a panel of 30 Romanian entrepreneurs or top-management persons in the field of biotechnology. The set of 50 questions have covered different topics, respectively the general profile of the respondents and their companies, entrepreneurial profiling from the respondents' point of view or the entrepreneurial societal context. It was concluded that the intervention areas would be the following: much more measures to support young entrepreneurs, less bureaucracy and taxes, changes in work legislation, professionalism in funding agencies, more training opportunities and written guides, changes of the negative society's perception about the entrepreneurship. An important conclusion of the study was that the training, especially the high-education, is an important factor for starting and running a business in the biotech field.

Key words**:** *biotechnology, entrepreneurship, top management, profiling, skills, competences*

INTRODUCTION

A biotech entrepreneur is unique from all other entrepreneurs; a too cautious, too analytical and too practical person will never start a business in biotech [8]. Apart of being independent, confident, having willingness to take risks, having passion for its work and ability to work long hours, the biotech entrepreneur is usually an accomplished scientist, bioengineer, physician or business person capable to identify problems but not focusing too long time on, finding lots of solutions to any situation. Concluding, it takes a certain type of personality to work out independently, but there is also a range of skills needed to find success.

As reported by the European Commission experts [3], in 2015 were registered about 450,000 SMEs in Romania and the Romanian SME sector provided about 67.5 % of employment in the private sector, slightly above the EU average in 2015. About 60% of such SMEs have one or two employees. To understand the context, the country was hit by the economic crisis which spread across Europe in 2008. The private sector played a vital role in economic recovery and, by 2011, the Romanian economy had returned to a path of growth, but despite reaching a promising dynamic with 4.8% GDP growth in 2016, the country has yet to recover fully from the crisis (EC, 2017).

During the implementation of the Erasmus+ project 2017-1-RO01-KA203-037304 [11], the authors have conducted a survey among Romanian biotech business persons trying to profile the national biotech entrepreneur skills, knowledge and competencies in the national context.

MATERIALS AND METHODS

During 2018 the team has developed a survey, on both printable and digital (on-line) format, and sent to about 200 potential respondents via e-mails or on paper support. The study was based on a questionnaire of 50 questions covering different topics, respectively the general profile of the respondents and their companies, entrepreneurial profiling from the respondents' point of view or the entrepreneurial societal context.
The questions and answered have been grouped as following: (1) general information on the responded; (2) respondents' companies profile; (3) respondents profile; (4) biotech entrepreneur profile through entrepreneurs' eyes; (5) biotech entrepreneur in the societal context.

RESULTS AND DISCUSSIONS

Comprehensive data and statistics about Romanian biotech SMEs couldn't be found. However, the Romanian Biotech Database [7] has registered only 28 companies in the Life Sciences sector in the sector of which 28% where in pharma industry, 39% offering medical services and only 25% were dedicated to biotech research & innovation or services.
After repeated attempts of spreading the questionnaire, towards more than 200 targeted persons, have been received answers from a panel of 30 Romanian entrepreneurs or top-management persons in the field of biotechnology. Considering the fact that that entrepreneurial initiatives in Romania are rather limited, and in the Biotech field is even more limited, the panel was considered as representative.

General information on the respondents

Form the total respondents only 30% were shareholders of the companies, while 33% were employers with management responsibilities. All respondents have graduated university programs of different levels: 23% finalized bachelor studies, 37% hold a master degree, 20% graduated other post-university studies and only 20% hold a PhD diploma. From all this higher education graduation, 73% have followed other trainings in different topics (Fig. 1). It can be noticed that 43% have followed economic training of which 5% followed entrepreneurship classes. Our results are in line with results reported by other authors [4, 10] which emphasize the demand in biotech companies for staff with a high level training (PhD and postdoctoral graduates), instead of high-school or bachelor graduates.

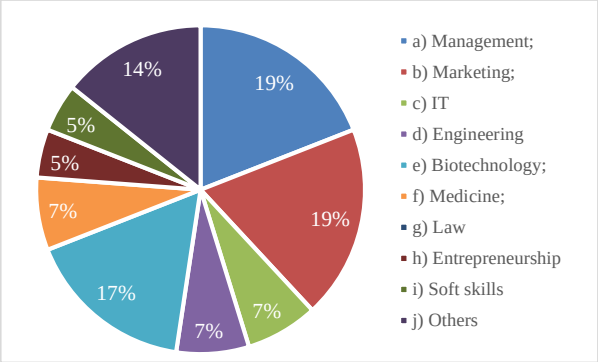


Fig.1. Distribution of the training courses followed by Romanian biotech entrepreneurs
Source: own analysis.

In terms of income, over half (57%) of the respondents have a modest income comparing with other biotech employed people in Europe [2], respectively maximum 1,000 euro/month; 23% have an income between 1,000 and 2,000 euro; 10% between 2,000 euro and 3,000 euro and only 10% over 3,000 euro/month.
One third of the respondents (33%) declared that they are over 45 years old and only 17% are still in there teen (most probably recently graduated). However, as gender distribution, it was scored equally 50% men- 50% women.

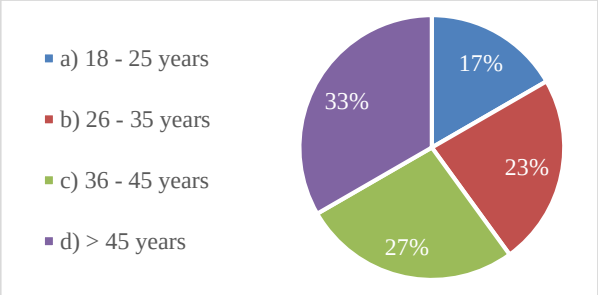


Fig. 2. Age distribution among Romanian Biotech entrepreneurs
Source: own analysis.

Respondents' companies profile

When asked about their companies' profile (Fig.3) almost half (43%) are in pharma and medical sector, 16% in food industry and 13% in agricultural biotech companies. According to their statements, over 55% of their companies have been set on the market 10 years ago, while only 17% are "young companies" (1 to 5 years old).

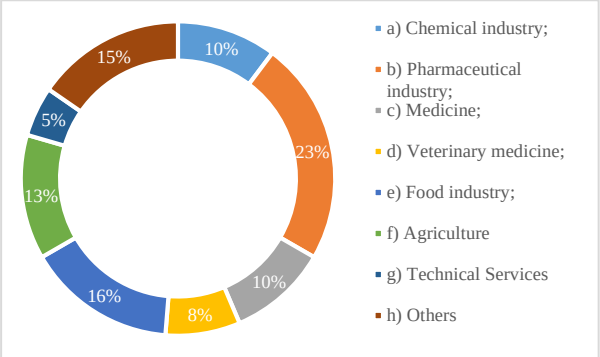


Fig. 3. Companies' profile of the respondents employed in biotech field
Source: own analysis.

In terms of the **size** of their companies, half of them have over 50 employees, while only 20% are of small size (2-4 employees). Of all these companies, over 63.3% are acting on international market, 20% are active on national market and the rest on local/regional level. Correlated with this, only 20% has declared that they have a family business.

Respondents' profile

The respondents have been asked about their attitude on risk in business. Almost half (44.5%) declared that they are caution persons and prefers small, but safe gains; the rest (65.5%) declared that they are not afraid of taking risks, assuming the idea that gaining and losing are part of the business.

The understand the respondents' choice for their job or initiative, some questions have been connected to their families, background and beliefs. One of such question was related to their family background in entrepreneurship; surprisingly, or not, almost half of the respondents (47%) answer that in their families were taken entrepreneurial initiatives and 79% of such initiatives are considered as successful.

An interesting answer was that 75% of the respondents are on their first entrepreneurial attempt, while the rest on the second attempt and they haven't lost their confidence in success. As inspirational sources for starting their business 34% declared that university studies were their running support, while 18% from former job or project research in which they were involved.

When asked what made them to start their business, almost half of the respondents (45%) have chosen the answer "I am passionate and I think I can add value in this field making use of my knowledge and expertise", 25% declared that the desire of being independent was the driven thought, while 20% are sure that a biotech company has stability on the market and is a sure job.

To see how dedicated are to their jobs, the respondents have been asked about daily allocated time to their work; looks like being biotech entrepreneur is demanding, because over 60% declared they are working over 10 hours a day.

In terms of financial resources, the answers distribution was not very surprising. When started the business 50% declared as source their own funds and 30% from families or friends. Nowadays, when the business is running, the 87% of the respondents declared that the company profit is the main source of funding. Only 6.7% are accessing non-refundable funding from national or European programs. This may be correlated with studies of [2] which reported that a survey conducted by the Romanian Council of SMEs shows that over 81% of SMEs do not intend to access structural funds in the future. One of the reason may be linked to the rate of success which is very low; according to the same survey, only 0.18% of the companies that try to access funding obtained an approval of their project.

On their start or during the company development the entrepreneurs have faced different challenges. When starting the business, the respondents said equally that finding financial sources (25%) and obtaining authorizations and approvals (25%) were the main challenging issues; other issues were

related to find experienced personnel (18%) and the high taxes (18%). Our data is in agreement with data reported for the period 2009-2014 by other authors, after the last economic crisis [12]. During the business development, the first challenging issue is linked to bureaucracy (34%) and difficulties in accessing new sources of funding (23%); high taxes (13%) are still an issue.

An important image on the respondents' profile was there happiness in relation to their actual working status; less than expected, only 56% declared to be in different degrees of happiness, while the other 44% are not happy at all and have to change something in their working situation.

The most important values that have supported the Romanian respondents in their decision of becoming an entrepreneur or helped them to make the career choice were the following: creativity, independence, flexible working program, being recognised as specialist in the field, honesty and cooperation.

From a scale of 1 to 5, the respondents placed their managerial skills at 3.7; in the same scale, other valences of the respondents were, in order, the following: team working and capable to solve problems; creative thinking; communication skills; negotiation and conflict resolution; networking, time management, leadership attitude. Among the respondents, 71% declared that they have good and very good technical skills.

Some free style questions have been proposed to the respondents. When asked about what is the most important principle / rule that guides them in their personal life the answers varied a lot, from honesty and fair-play to being empathic, stay close to the family, modesty and kindness.

Meanwhile, they have been asked what is the most important principle / rule for guiding in business and the answers varied again: action, dynamism, competences, professionalism, fair play, respect, take risks, invest and develop, innovate, passion.

Also, the respondents have been asked if they have entrepreneurial models and very divers examples have been chosen, of national or international interest. The nominated Romanian models of international recognition were Ion Tiriac (automotive and insurance), Ana Aslan (health and pharmacy services and produces), Sorin Minea (food industry), while international nominated were mainly IT titans (Bill Gates, Steve Jobs) and Andrew Carnegie (steel industry).

Biotech entrepreneur profile through respondents' eyes

After looking on their insight and answering on issues related to their status and companies, the respondents were asked about what would they believe to be the "ideal" in biotech entrepreneurship.

On the respondents' belief, to be a successful biotech entrepreneur you need to have managerial skills (97%), to have interpersonal skills like communication, negotiation, teamwork, time management, networking (85%), to have a large social network (almost 76%), which is agreement with what was reported by [9]. Only 58% of the respondents consider that having technical skills in the field is a request for success.

Meanwhile, 86% agreed that innovation is a key quality of the biotechnology entrepreneurship, while 71% considered that entrepreneurial skills can be gained through education.

Asked about which expertise may have the highest impact on the biotech business success, the Romanian entrepreneurs believe that equal contribution have the following (about 3.3 each, as value on a scale from 1 to 5): leadership, communication, innovation capacity for creating new products / services, building / integrating into a strong professional network, rapid and effective adjustment to environmental progress; marketing skills, using modern management methods and techniques, identifying new business opportunities. Actually, leadership is considered all over the world one of the most important driving experience in biotech entrepreneurship [6].

Biotech entrepreneur in the societal context

The biotech entrepreneurs' beliefs in relation to the societal context are somehow concerning. Over half of them (62%) do not

agree with the idea that they have a good image in the society and media attention spotted on them. In contrast, almost 76% of the respondents agree with the idea that entrepreneurship is considered a valuable professional choice for both the entrepreneur and society.

Also, attention has been given to the potential reasons for the business failure. Business failure was considered by 64% of the respondents the result of lack of managerial skills, while the rest agreed that failure is due to the lack of technical skills in the field. As a good point, almost 72% considered that failure is not a reason to don't start a new entrepreneurial initiative and such failure doesn't influence negative the society perception on starting a business.

When asked about what is the most common way to access information / acquire skills and knowledge for business development, the answers were somehow equally distributed (Figure 4); more importance are given to attending courses and to networking (discussions with other entrepreneurs).

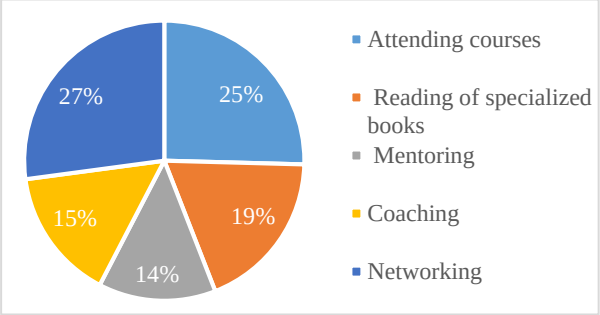


Fig.4. Answers distribution on ways to access information or acquire skills and knowledge for business development
Source: own analysis.

Asked about the national societal context, only 24% of the respondent biotech entrepreneurs agreed that the national culture encourage the entrepreneurial initiatives. Solutions have been proposed in the last time; high trust and large network of the entrepreneurial ecosystem may accelerate the knowledge and innovation process and universities may play a major role in this direction [5]. As a regional study in Timis county emphasized, changing culture can be done through education [1].

A challenging free question addressed was if they have had the power to make a change in Romania, what would they change to encourage entrepreneurship. The answers were: less bureaucracy, less corruption, special funds and financial facilities for young entrepreneurs, easy access for funding, create and maintain a competition context, develop guidance tools and trainings, changes in the society negative perception on the people having entrepreneurial initiatives.

In the very end, the biotech entrepreneurs have been asked to provide some advices to the young people eager to start a business in biotechnology field. Here are some responses: in the category TO BE were include professional, patient, creative, hardworking, optimist, perseverant; have courage; updated skills and competences; any idea should be tested, even if it fails; biotechnology has vast applications, take one; access the existent know-how.

CONCLUSIONS

Our survey on a representative panel of Romanian entrepreneurs or top-management persons in the field of biotechnology lead to a series of conclusions, much or more correlated to the entrepreneurial context in the country.

In biotech companies there is a high demand for tertiary level graduates (master, PhD) and these graduates have to continuously improve their technical and managerial knowledge and skills following training courses.

Among Romanian biotech entrepreneurs, only 17% are recently university graduates, of maximum 25 years old. On gender level the distribution is equal among men and women.

Most of the biotech companies in Romania have a health/pharma profile, followed by food industry and agricultural goods and services and only 20% of all are of small size (2-4 employees). Over half of the respondents belongs to companies active on international level.

Regarding the Romanian entrepreneur profile here are some conclusions on the surveyed panel: 65.5% are not afraid of taking risks, assuming the idea that gaining and losing are part of the business; the main inspirational sources of starting the business were university studies and former job or involvement in a research project. They have identified own valences the team working and capability to solve problems; creative thinking; communication skills; negotiation and conflict resolution; networking, time management, leadership attitude.

In terms of challenges, when starting the business, the respondents indicated equally as most challenging, to find financial sources and to obtain authorizations and approvals, followed by finding experienced personnel and the high taxes. During the business development, the first challenging issue is linked to bureaucracy and difficulties in accessing new sources of funding, while high taxes are still an issue.

On an ideal vision, the respondents indicated that to be a successful biotech entrepreneur you need to have managerial /leadership skills, to have interpersonal skills like communication, negotiation, teamwork, time management, to have a large social network. They have all agree that innovation is a key quality of the biotechnology entrepreneurship.

An important conclusion of the study was that the training, especially the high-education, is an important factor for starting and running a business in the biotech field

When asked about the national societal context, most of the Romanian biotech entrepreneurs agreed that the national culture doesn't encourage the entrepreneurial initiatives. In return, when asked if they have had the power to make a change in Romanian entrepreneurial environment, what would they change, answers were linked to less bureaucracy, less corruption, special funds and financial facilities for young entrepreneurs, create and maintain a competition context.

Instead of ending with our conclusions, we choose to put here conclusions from our interviewed biotech entrepreneurs. The most important said the biotechnology business is an extremely beautiful business, even if is challenging; there are plenty of opportunities, importantly is to take the chance.

ACKNOWLEDGEMENTS

This study was carried out with the support of Erasmus+ project 2017-1-RO01-KA203-037304 "Supporting biotechnology students oriented towards an entrepreneurial path" (SupBioEnt).

REFERENCES

[1]Brancu, L., Munteanu, V., Gligor, D., 2012, Study on Student's Motivations for Entrepreneurship in Romania. Procedia-Social and Behavioral, 62: 223-231.
[2]European Commission, 2016, The Romanian Entrepreneurial Ecosystem Background Report.
[3]European Commission, 2017, Specific Support to Romania – Starts-ups, Scale-ups and Entrepreneurship in Romania.
[4]Jimenez, A., Palmero-Camara, C., Gonzales-Santos, M.J., Gonzalez-Bernal, J., Jimenez-Eguizabal, J.A., 2015, The impact of educational levels on formal and informal entrepreneurship. BRQ Business Research Quarterly 18: 204-212.
[5]Lianu, C., 2017, Bio economy and entrepreneurial ecosystem patterns: case study for Romania-USH Pro Business. J. of Ec. Development and People, 1: 22-27. Academi OneFile.
[6]Patzelt, H., Schweizer, L., Behrens, J., 2012, "Biotechnology Entrepreneurship", Foundations and Trends® in Entrepreneurship: 8 (2): 63-140.
[7]Romanian Biotech Database, http://www.romanianbiotech.com/rom/portal/stats_sectors.php. Accessed on February 22nd 2019.
[8]Shimasaki, C.D., 2009, The Business of Bioscience: What Goes into Making a Biotechnology Product, Chapter 2: 9-26, Springer Science+ Business Media, Springer Dordrecht Heidelberg.
[9]Shimaski, C.D., 2014, Biotechnology Entrepreneurship. Chapter 6: 76-81. Academic Press.
[10]Stanciuc, N., Stanciu, S., Nistor, C., Rapeanu, G, Bahrim, G., 2010, An overview on the current status of Romanian biotechnology in educational and trade sector. Innovative Romanian Food Biotechnology, 7:1-11.
[11]SupBioEnt, Suporting biotechnology students oriented towards entrepreneurial path, www.supbioent.usamv.ro. Accessed on February 25nd 2019.
[12]Zaman, G., Vasile, V., Cristea, A., 2012, Outstanding aspects of sustainable development and competitiveness challenges for entrepreneurship in Romania. Procedia Economics and Finance 3: 12 – 17.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE IMPACT OF FISCAL POLICIES ON CORPORATE INSOLVENCIES IN THE EUROPEAN COUNTRIES

Neli MUNTEAN[1], Romeo Cătălin CREȚU[2], Iulian MUNTEAN[3]

[1]Academy of Economic Studies of Moldova, Chisinau, Republic of Moldova, Email: nelimuntean8@gmail.com
[2]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, Email: creturomeocatalin@yahoo.com
[3]Agrarian State University of Moldova, Chisinau, Republic of Moldova, iulianase128@gmail.com

Corresponding author: nelimuntean8@gmail.com

Abstract

The institution of bankruptcy is necessary and obligatory in any market economy. Mostly, a company's insolvency is caused by the simultaneous effect of different causes, which act on the various indicators of the company's business. In addition, the practice has shown that a firm does not fail suddenly, but the process of performances decrease extends over a long time. That is why, it is important to analyse the impact of fiscal policies on corporate insolvencies. The effects of fiscal policies on the economic growth have been extensively studied in the literature. To achieve the purpose of the research, we analysed the link between the level of fiscal policies and the corporate insolvencies in the European countries. A correlation-regression analysis was conducted on a sample of 32 countries over the period 2013-2017. From the analysis results, it is evident that the low fiscal freedom leads to a lower level of corporate insolvencies. Our findings suggest that EU governments and policy-makers need to acknowledge that in order to develop the European framework for restructuring and bankruptcy management it requires the right fiscal policies.

Key words**:** *Corporate insolvencies, Fiscal policies, Correlation-regression analysis, Bankruptcy*

INTRODUCTION

Nowadays, the problem regarding the corporate insolvencies is actual and much discussed theme in market economy. The bankruptcy of a company has negative impact on all subjects in relationship with this entity. Possibility of evaluating and estimating the factors that may influence on corporate insolvencies of a country is an advantage for all external and internal users. Based on the assessment and identification of general environment factors on levels of bankruptcies, EU is able to take necessary corrective action in time in order to develop the European framework for restructuring and bankruptcy management.

Therefore, it is important to outline the problems and the main bankruptcy causes at the level of the European countries.

Fiscal policy is often linked with business activity, in which the high level of fiscal pressure influence negatively on economy of any country. The starting point of this study consists in finding few, inconclusive results in the literature regarding the influence of fiscal pressure or fiscal freedom on the level of corporate insolvencies. Thus, in this paper, we will highlight the biggest obstacles to the development of European Union countries in a transnational analysis perspective. The objective of this research is to analyze the influence of fiscal freedom and the quality of rule of law on corporate insolvencies. A correlation-regression analysis was performed on a sample of 32 countries during 2013-2017. Our findings suggest that the influence of fiscal freedom and lack of quality of rule of law on corporate insolvencies is significant. These two factors need to be taken into account by the EU, which is actively seeking to develop the European framework for bankruptcy restructuring and management.

Literature review

Research regarding bankruptcy prediction of a company is important in the context of

streamlining the restructuring and insolvency procedures [3]. In developed countries, the first bankruptcy estimation studies date back to the early 20th century. In Central and Eastern Europe, due to several factors, especially due to: the geopolitical situation, the economic system introduced, this research topic began to be studied only in the 1990s. Initially, due to the lack of statistical databases in most Central and Eastern European countries models of developed countries were used to estimate the level of bankruptcy risk. Subsequently, were developed more sophisticated studies based on the investigation of general environment factors influence on levels of bankruptcies [10].

From this, Cândido Peres and Mario Antão [9] were able to identify 123 different models of bankruptcy risk prediction. According to their analysis the most researched countries in this area, or those with the greatest number of published models, are the United States (30), the United Kingdom (21) and Spain (16) with approximately 24%, 17% and 13% of the total, respectively.

Thus, bankruptcy analysis in the corporate sector, in the context of developing multivariable analysis models, is an element of high originality.

A driver of bankruptcy is taxation system and especially its complicity. Complicated tax system usually directly affects private sector. Constantly increasing tax burden, unplanned tax inspections, unofficial tax payments and extremely high fines make it very difficult to conduct business [14, 11, 12]. The results of the surveys showed by Ahlin [2] note that tax regulations is indeed a serious obstacle in doing business. Taxes have strong impact on business conditions by influencing incentives and behavior of economic actors.

MATERIALS AND METHODS

Variables and data sources

The objective of our research consists in the verification of the correlation between the corporate insolvencies, the level of fiscal freedom and the quality of rule of law.

Corporate insolvencies were selected from the study made by Creditreform (Creditreform study: Corporate insolvencies 4 in Europe, 2017/18) [4]. Should be mentioned that insolvencies are usually only a fraction of the total liquidated business. Moreover, in many countries, small firms with financial difficulties are often closed without any ordinary insolvency procedure. At the same time, insolvency law are vastly different among countries, thus in the given paper, terms ‘bankruptcy’ and ‘insolvency’ are considered synonymous, and they refer to the procedure of general distrain of legal persons property, excluding private bankruptcies.

Fiscal pressure or fiscal burden is a measure of the tax burden imposed by government. It is a difficult measure to define, because the tax and social security systems varies from one country to another. A measure of fiscal burden is *fiscal freedom*, which includes direct taxes, in terms of the top marginal tax rates on individual and corporate incomes, and overall taxes, including all forms of direct and indirect taxation at all levels of government, as a percentage of GDP. It is composed of three quantitative factors (j), namely: a) the top marginal tax rate on individual income; b) the top marginal tax rate on corporate income; c) the total tax burden as percentage of GDP [8]. The fiscal freedom index ranges from 0 to 100, where 100 is the maximum degree of fiscal freedom and 0 represents the least fiscal freedom. Thus, the higher the fiscal burden, the lower the fiscal freedom. This index was used by different authors in their works (Torgler & Schneider; Achim & Borlea) [16, 1] in order to represent the level of fiscal burden of a country.

The rule of law Index provided by World Bank data, reflects the extent to which agents trust and respect the rules of society, and in particular, the quality of contract execution, property rights, police, and courts, as well as the likelihood of murder and violence [18, 17]. World Bank calculates the country's score on the aggregate indicator, in units of a standard normal distribution from -2.5 (weak) to 2.5 (strong) in governance performance.

All the indicators and their data sources that are to be used in our model are briefly summarized in Table 1.

Table 1. Variables and data sources

Variable Name	Description	Source
Corporate insolvencies (CP)	Corporate insolvencies represent the number of total liquidated business of a country.	Creditreform study: Corporate insolvencies 4 in Europe, 2017/18
Fiscal burden or Fiscal freedom variable (FIF)	It ranges from 0 to 100, where 100 is the maximum degree of fiscal freedom and 0 represents the least fiscal freedom. Thus, the higher the fiscal burden, the lower the fiscal freedom.	The Heritage Foundation
Rule of law Index (RL)	It is supposed to reflect the perceptions about private and intellectual property rights protection, quality of contract enforcement and likelihood of property confiscation. It ranges from -2.5 (weak) to 2.5 (strong) in governance performance	World Bank, The Worldwide Governance Indicators

Source: elaborated by authors.

The following research hypotheses were proposed:

• ***H1*** *= the rise in fiscal freedom is associated with a greater number of bankruptcies;*

• ***H2*** *= a higher level of quality of rule of law diminishes the number of corporate insolvencies.*

In order to achieve the proposed objective and to test these two hypotheses, the following methods were used: data collecting, data processing and empirical analysis, this being materialized through a panel analysis.

The data sample consists of 32 countries: 17 countries of Western Europe and 15 of Central and Eastern Europe, over the period 2013-2017.

In order to point the influence of the considered variables on corporate insolvencies, the next baseline equation model was proposed:

$$CP_{i,t} = \boldsymbol{\alpha_i} + \beta_1 FIF_{i,t} + \beta_2 RL_{i,t} + \boldsymbol{\varepsilon_{i,t}} \quad (1)$$
$$i=1,\ldots, N;\ t=1,\ldots, T$$

where:

-$CP_{i,t}$ reflects the number of corporate insolvencies of a country i;

-$FIF_{i,t}$ is the fiscal freedom variable;

-$RL_{i,t}$ denotes the extent to which agents trust and respect the rules of society (a negative sign is expected);

-ε_{it} reveals the error term.

Table 2 reports summary statistics of the unbalanced panel data.

The value of Jarque Bera's test highlights that fiscal freedom and rule of law indicators are normally distributed, but the values of corporate insolvencies are not distributed normally, so errors can vary. That is why it is important to check the regression for the heterogeneity of errors.

Table 2. Summary statistics

Sample: 2013 2017

	CORP_INSOLV	FISCAL FREEDOM	LAW
Mean	8985.210	67.98662	1.025096
Median	4544.000	66.60000	1.080000
Maximum	61429.00	94.00000	2.100000
Minimum	108.0000	37.20000	-0.810000
Std. Deviation	13191.65	15.27942	0.799534
Skewness	2.612117	-0.132952	-0.454819
Kurtosis	9.721247	1.874061	2.162522
Jarque-Bera	474.0601	8.755646	10.00097
Probability	0.000000	0.012553	0.006735
Observations	157	157	157

Source: Author's own calculations.

The value of the Skewness indicator for fiscal freedom and rule of law indicators highlights a negative asymmetry in their values (Skewness <0) and a positive asymmetry for bank failures (Skewness> 0). The Kurtosis indicator is greater than 3 only for the corporate insolvencies, which means that the values of this indicator follow a leptokurtic distribution, most of the values being concentrated near the average, which implies higher probabilities for extreme values than when a normal distribution is recorded.

Methods

The dataset of our research involves both cross-sectional and time-series variations that is why panel data analysis is applicable. For econometric models with panel data, empirical analysis begins with a choice between models with a general effect and specific effects. As a null hypothesis in the F-test, was formulated the lack of panel structure for the data, as well as, the possibility to obtain according to the pooled model using the OLS the consistent and effective estimators. Then, based on F-statistics, the coefficients of the corresponding models determination were compared.

Panel data is usually examined with one of basic models - random effects (RE) or fixed

effects (FE). Further, to determine the feasibility of choosing between models with random (RE) and fixed (FE) effects, the Hausman test was conducted. This test confirmed the validity of choosing the model with fixed effects, because the p-value for the model resulted in significant level, lower than critical value of 0,05. Thus, the null-hypothesis is rejected because random effects do not give consistent and effective estimates, is inconsistent [7]. For this reason fixed effects is applicable.

An advantage of FE model consists in possibility of unobserved characteristics elimination if they are time-invariant, so it permits estimating the net effect of the explanatory variables on the outcome [15]. Accordingly, FE method particularly fits for estimating corporate insolvencies that depends on time invariant heterogeneity differences among countries.

Another reason to use FE method for our analysis is due to the fact that FE estimator could resolve endogeneity problem [6].

Elimination of both the endogeneity problem and the source of omitted variable bias in the FE model can be performed using deviations-from-means estimator, or so-called "within estimator".

It follows that FE regression holds constant average effects of each data category, i.e. country in the case of this work. Consequently, coefficients in FE model tell how much each observation differs from the average; namely, FE regression reports the average within-group effect. Additionally, FE regressions are particularly important to use when data is categorized, because it can be tricky to control for all characteristics of the categories [13]. All the procedures mentioned above we accomplished with the help of EViews software.

RESULTS AND DISCUSSIONS

Results of the hypothesized assumptions

The results of testing both hypothesis are shown in Table 3. The results are based on the panel regression equation including the dependent variable, CP and two explanatory variable, FIF and RL at the time.

In table 3 performed with the help of EViews software, we find the estimated coefficients and probabilities associated with them, the standard errors, and the value of t-Statistic test.

Table 3. Testing regression model parameters on panel data

Dependent Variable: CORP_INSOLVENCIES
Method: Panel EGLS (Cross-section weights)
Date: 03/23/19 Time: 18:57
Sample: 2013 2017
Periods included: 5
Cross-sections included: 32
Total panel (unbalanced) observations: 157
Linear estimation after one-step weighting matrix
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FISCAL FREEDOM	16.04338	5.419689	2.960203	0.0037
LAW	-826.9633	216.6947	-3.816260	0.0002
C	8742.191	498.3385	17.54268	0.0000

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.991206	Mean dependent var	21157.70
Adjusted R-squared	0.988847	S.D. dependent var	21081.61
S.E. of regression	2506.112	Sum squared resid	7.73E+08
F-statistic	420.1294	Durbin-Watson stat	1.257093
Prob(F-statistic)	0.000000		

Source: Author's own calculations.

Since the values of the coefficients are significantly different from zero, it can be deduced that there is interdependence between the dependent variable, the corporate insolvencies and the independent variables, as follows:

-A higher level of fiscal freedom (together with low fiscal pressure) leads to a higher level of corporate insolvencies. Increasing with a unit the level of fiscal freedom will cause a growth in the average of 16 units of the corporate insolvencies indicator.

-Increasing with a unit the level of rule of law will cause a reduction in the average of 827 units of the bankruptcy indicator.

Adjusted R-squared (0.989) indicates a strong intensity of the relationship between the dependent variable and the two independent variables. Thus, 98.9% of the change in the number of bankruptcies is determined by the variation of the independent variables, the difference being caused by the variation of the residual variable and the errors (e) respectively.

The value of the Adjusted R-squared is close to that of the R-squared coefficient, which means that the developed regression model can be extended to all the analyzed countries [5]. The value of the F test is statistically significant (420.1) and the probability that the identified relationship between the variables studied in the model is random is null. The value of the Durbin-Watson test (1.26) indicates that the regression model from the point of view of the lack of autocorrelation of the residual variable is valid.

This result fully conforms to the hypothesis H1 and H2. Thus, a higher level of fiscal freedom (together with low fiscal pressure) leads to a higher level of corporate insolvencies. It may be caused by the fact that year by year the efficiency of institutions is lower and the government institutions are weak, and do not succeed in controlling. As a result, higher fiscal freedom (meaning lower fiscal pressure) leads to a greater number of bankruptcies under weak quality institutions.

CONCLUSIONS

The purpose of this article is to observe the correlation between the number of bankruptcies, the level of fiscal freedom and the quality of rule of law in the European Union countries. To achieve the goal, firstly we defined what the causes that may influence on bankruptcy phenomenon are. Secondly, we have set two hypotheses, based on which a model has been created that combines the influence of fiscal freedom and rule of law on the number of bankruptcies. A panel analysis was used on a large sample of 32 countries over the period 2013-2017.

Due to the fact that coefficients values in the panel regression model are significantly different from zero, it has been demonstrated that for the period 2013-2017, at the level of the 32 EU countries exists a strong interdependence between the corporate insolvencies recorded in each country and independent variables used in the model, namely: Fiscal Freedom and Rule of Law. Interdependence is confirmed by the value of the Adjusted R-squared coefficient, 98.9% of the modifications in the number of bankruptcies are determined by the variation of the independent variables.

Based on the findings of this paper, the lesson for EU countries can be crucial. It was found that a higher level of fiscal freedom (together with low fiscal pressure) leads to a higher level of corporate insolvencies. It may be caused by the fact that year by year the efficiency of institutions is lower and the government institutions are weak, and do not succeed in controlling. As a result, higher fiscal freedom (meaning lower fiscal pressure) leads to a greater number of bankruptcies under weak quality institutions. These factors need to be taken into account by the EU, which is actively seeking to develop the European framework for restructuring and bankruptcy management.

REFERENCES

[1]Achim, M. V., Borlea, S. N., Anghelina, A.M., 2018, The impact of fiscal policies on corruption: A panel analysis. South African Journal of Economic and Management Sciences, Vol.21 (1), https://sajems.org/index.php/sajems/article/view/1970/1096, Accessed on March 2019

[2]Ahlin, C.R., 2001, Corruption: Political Determinants and Macroeconomic Effects, Working Paper, no. 01-W26, http://www.accessecon.com/pubs/VUECON/vu01-w26.pdf, Accessed on March 2019.

[3]Conseil de l' Europe, 1996, Programme d'action la corruption adoptế par le Comitế des Ministres, Strasbourg, https://rm.coe.int/168007f3f8, Accessed on March 2019.

[4]Credit reform study: Corporate insolvencies 4 in Europe, 2017/18, https://www.creditreform.de/fileadmin/user_upload/crefo/download_de/news_termine/wirtschaftsforschung/insolvenzen-europa/analyse_EU-2017-18_englisch_wirtschaftsforschung.pdf, Accessed on March 2019.

[5]Field, A., 2005, Discovering Statistics Using SPSS, Second Edition, Sage Publications Ltd 2005, https://www.researchgate.net/publication/247826587_ Discovering_statistics_using_SPSS_2nd_edition_Andy _Field_London_Sage_Publications_Ltd_2005_Pbk_27 99_ISBN_0-7619-4452-4, Accessed on March 2019.
[6]Frèchette, G.R., 2006, A Panel Data Analysis of the Time-Varying Determinants of Corruption, CIRANO – Centre interuniversitaire de recherche en analyse des organisations, http://www.cirano.qc.ca/files/publications/2006s-28.pdf, Accessed on March 2019.
[7]Green, W.H., 2005, Econometric Analysis. Pearson Education International. 1026 pg., pg. 289-303.
[8]Heritage Foundation 2019. http://www.heritage.org/index/fiscal-freedom/, Accessed on March 2019.
[9]Peres, C., Antão, M., 2017, The use of multivariate discriminant analysis to predict corporate bankruptcy: A review AESTIMATIO, The IEB International Journal of Finance, 14, pp. 108-131, https://www.researchgate.net/publication/310003046, Accessed on March 2019.
[10]Prusak, B., 2018, Review of Research into Enterprise Bankruptcy Prediction in Selected Central and Eastern European Countries. Int. J. Financial Stud. 2018, 6, 60.
[11]PwC (2013a), Paying Taxes 2013, The global picture, http://www.pwc.com/gx/en/paying-taxes/assets/pwc-paying-taxes-2013-full-report.pdf, Accessed on March 2019.
[12]PwC (2013b), Doing business and investing in Ukraine, http://www.pwc.com/en_UA/ua/survey/2013/assets/ukraine_doingbusiness_2013.pdf, Accessed on March 2019.
[13]Sentence, A., 2013, An economic analysis. Taxation, economic growth and investment, Paying Taxes 2013, The global picture, pp. 23-28, http://www.pwc.com/gx/en/paying-taxes/assets/pwc-paying-taxes-2013-full-report.pdf, Accessed on March 2019.
[14]Sivula, I., 2015, What drives corruption and how corruption impacts business formation? A case study of Ukraine in a prospect of cross-country analysis. Master's Thesis. University of Fribourg, and University of Tampere, tampub.uta.fi/.../98100/GRADU-1446032677.pdf;sequence=1, Accessed on February 2019.
[15]Torres-Reyna, O., 2007, Panel Data Analysis. Fixed and Random Effects using Stata (v. 4.2), Princeton University, http://www.princeton.edu/~otorres/Panel101.pdf, Accessed on March 2019.
[16]Torgler, B., Schneider, F., 2007, The Impact of Tax Morale and Institutional Quality on the Shadow Economy. IZA Discussion Paper, http://ftp.iza.org/dp2541.pdf, Accessed on March 2019
[17]World Bank 2017. The Worldwide Governance Indicators. Available at http://info.worldbank.org/governance/wgi/#doc. Accessed in February 2019.
[18]World Bank 2019. Available at: < www.worldbank.org >, Accessed on February 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

AN ASSESSMENT OF THE DETERMINANTS OF GAMBIA'S AGRICULTURAL EXPORTS PERFORMANCE

Assan NDIMBALLAN, Adebayo Abdulateef ODEYEMI, Serkan GURLUK

Uludag University, Özlüce Mahallesi, Görükle Kampüsü, 16059 Nilüfer/Bursa, Turkey, Mobile: +90 5325966620, Emails: assanndimz@gmail.com, lateef.odeyemi1@gmail.com, serkan@uludag.edu.tr

Corresponding author: assanndimz@gmail.com

Abstract

Due to the contribution to earnings from foreign exchange and the total labour force which stands at 70 and 75 percent, agriculture ranks high as one of the main sources of income for the Gambia. However, her agricultural exports - majorly groundnuts, cashew nuts and fisheries - have been subjected to quantity, price fluctuations and consequently low competitiveness in the international market. For this reason, this study assessed agricultural export performance of the Gambia with data from the Gambia Bureau of Statistics (GBoS), the Ministry of Trade Industries and Employment of The Gambia (MoTIE) and other literature. The study concluded that in the Gambia, economic growth and agricultural performance are related and move in the same direction with output level, trade openness, competitive of produce in international market among the key factors that determine agricultural export performance in the Gambia.

Key words**:** *agriculture, export performance, foreign exchange, labour force, the Gambia*

INTRODUCTION

One of the similar characteristics of modern day economy is the willingness to tap well into the opportunities of international trade. With that in mind, why no economy is exempted from the international trade is largely understood without ambiguities but rather, countries have continued to tap into the aspects of international trade for which they are largely at advantage whether in comparative or absolute terms.

For The Gambia, her dominant strategy from inception, in international trade, is principally agriculture-dependent. Economic data overtime shows a consistent relationship between various economic variables and agriculture. For example, about 23% of Gambian GDP is derived from agriculture, consisting the employment opportunities and the main source of livelihood for 75% of her population. Furthermore, half of the country's food demands are covered by agriculture which also contributes substantially to total exports in the country, contributing 70% of the foreign earnings. While 91% of the population are considered extremely poor, 72% of the poor depend entirely on agriculture.

As a result of its role in food security and poverty reduction tendency, the agricultural sector is regarded as a main drive for investments, wealth creation and economic growth.

The Gambia boasts of a comparative advantage on several of its agricultural produce, such as lowland rice, groundnuts, and coarse grains as well as vegetable production.

With regards to agricultural GDP, subsectors such as livestock, groundnuts and other crops accounts for 24 per cent, 23 per cent and 43 per cent, while fisheries and forestry collectively, account for 6 per cent of agricultural GDP [7].

The Ebola and the political crises alongside erratic rainfall contributed to the shock in the economy between 2015 and 2016 [10]. Following the occurrence, a re-assessment of the relationship that exists between agricultural exports and the economic growth is necessitated. Thus, opening a research gap to fill in this study.

MATERIALS AND METHODS

The materials for this study are both statistical data from the Gambia Bureau of Statistics [3]. A data set for the Gambia's GDP, agricultural exports with specific attention to groundnut, cashew nuts and fisheries from 2007 to 2016 are obtained.
The method will be descriptive statistics with the use of table and statistical tools such as tables and charts. Furthermore, the correlation coefficient analysis is used to determine the relationship between GDP used as proxy for economic growth and the total agricultural exports for period 2007 to 2016. The sign and size of (r) are explained with respect to empirical review of existing literature in order to highlight exports determinants of the agriculture produce of concern, in the Gambia.

RESULTS AND DISCUSSIONS

The correlation coefficient for the data analysed in this study is positive and also shows that a linear relationship exists between the GDP and agricultural exports (for fish and fisheries; groundnuts and cashew nuts) which means that both move in the same direction.
The numerical value of r in the result (0.75) indicates the strength of the linear relationship that exists between both variables. In other words, there is a strong relationship between both (Table 1).

Table 1. Correlation Coefficient for Gambia GDP and Agricultural Exports

Variables	Number of Observations	Pearson correlation coefficient (r)
GDP OF A. E	10 (2007 -2016)	0.752115304286721

Source: Own Calculation
KEY: A.E: Agricultural Exports

However, the Pearson Correlation Coefficient does not account for which of the variables affect each other but rather states the kind of relationship that exists between them. From the coefficient, the GDP - agricultural export relationship is in the same direction, which means that a growth in one is associated with the growth of the other, holding all other factors constant.

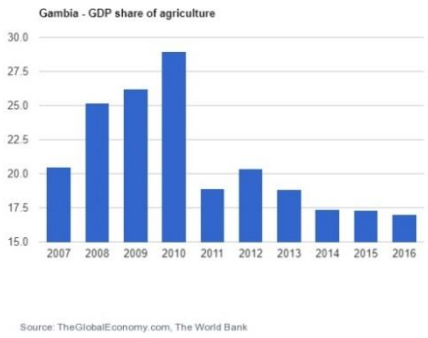


Fig. 1. Gambia – GDP share of agriculture
Source: The World Bank.

Figure 1 above illustrates the share of agriculture in the Gambia GDP from 2007 to 2016. From 2007 to 2010, the contribution of agriculture to the GDP was increasing but took a downturn in 2011, rose again in 2012 but declined further from 2012 to 2016.
Yaffa [11] observed that there was a huge recession in agricultural production in the year 2011 which was a direct consequence of drought experienced. The drought was considered the most severe experienced in the space of 20 years prior to that year.
Despite aiming to become a middle-income country by 2020, The Gambia remains, based on observed indices of development, a least-developed country. However, that has not prevented the country from growing. The vision 2020 of the Gambia set out some objectives for agriculture and natural resources [5]. Between 2004 and 2009, agriculture contributed an average 24.8% to the GDP and in 2010, the figure went up to 30%. Agriculture also provides employment and livelihood for over 75% of the countries labour force and also led real GDP growth from an average of 5.9% between 2003 and 2006 to about 7% in 2007 and 6.3% in 2008. In recent times, the agricultural sector's output and growth are accounted for by increasing government budgetary resources. For instance, a major area of focus for the ANR policy in the Gambia which was meant to last from 2006 to 2015, was enhancement of relationships between the agricultural sector and high value markets [5][9].

Empirical studies on the determinants of exports have varied among studies in the past. Observations from the findings of some of these studies, formed the basis for our discussions.

Generally, the empirical review is on two fronts; determinants of agricultural exports that were centred on Africa countries and those that with specific reference to The Gambia. The areas of divergent and convergent views are also explored to point out determinants that hold in the case of the Gambia.

In a study covering a 25-year period from 1984 to 2009 on the agricultural export trade in Ghana using the Ordinary Least Square (OLS) technique, results revealed that a positive connection exists between agricultural exports and determinants such as; production, openness to trade and index of competitiveness [1]. However, for The Gambia, these determinants have been mixed with limited alternatives due to interferences in the sector which have made farmers vulnerable and subjected to yield and price fluctuations [8].

While Gambian agriculture is largely subsistence, farmers rely on local markets to sell their farm surpluses which attract low prices to middlemen from Senegal and elsewhere in the sub-region. Farmers are therefore, constantly faced with market risks, the use of primitive farm inputs and little income earnings.

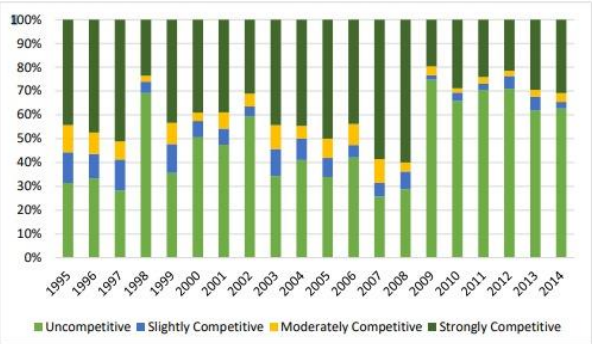


Fig. 2. Gambia's agricultural products competitiveness
Source: Gibba (2017).

With regards to the competitiveness of Gambia's agricultural product exports, groundnuts and its derivatives and cashew nuts constitute 50% of the total exported products during the period 1995 – 2014 in the Gambia with the country`s trade openness in the global market minimal due to its size [4].

In order to enhance a higher volume of agricultural exports and limit the fluctuating export competitiveness, Gibba [4] suggested robust policies and measures to stimulate higher export stability (Fig.2).

The competitiveness of agricultural products between 1995 and 2014 is shown in the figure above. Prior to 2009, the products` competitiveness was on a constant fluctuation, but from 2009 onwards a largely uncompetitive trend was observed.

Gbetnkom et al. [2] observed in their study that economies that are price – takers in the market of agricultural products have increased in export supply as a way of increasing export revenue.

The results in their study showed that, producer prices are important in driving export supply. To this end, availability of credit to farmers was highlighted.

The availability of credits to Gambian farmers is also a factor to increase the levels of agricultural production and by extension surpluses necessary for an increase in exports.

Ndubuto et al. [6] studied the determinants of agricultural exports in Nigeria and found that world export volume, exchange rate and output were determinants of exports from Nigeria.

Their findings were also consistent with that of Gbetnkom et al. [2], where results of OLS technique in the study indicated that output and the past value of agricultural exports influences current period agricultural exports.

General observations from the studies shows Gambian economy's dependence on agriculture is high, while the sector still remains subsistent and as such, the amount of revenue from agricultural export is relatively low.

Production level, productivity, trade openness, competitiveness of produce in international and exchange rate were identified as significant determinants of agriculture performance both on domestic fronts and with regards to foreign trade, particularly exports.

CONCLUSIONS

The role of agriculture in the economy of The Gambia is prominent and with respect to the overall economic performance the agricultural sector is vital. However, the sector remains largely subsistence; yet to attain the expected pull for the economy. Yields are generally low, implying that there is need for greater productivity and mass production required for the better participation in international trade associated with agricultural exports. As the highest employer of labour, passive transformation in the sector will bring about development in the overall economy.

In this study, it was observed that for The Gambia, a positive relationship exists between the GDP and agricultural export. However, the study has been constrained to the use of correlation analysis between the two due to insufficient data. As for the determinants of agricultural exports, previous studies on the subject matter provided the basis for their examination. The results from previous studies showed that, production quantity and value, trade openness, competitiveness, land use policies, access to financial credit and pricing are significant determinants of agricultural performance for domestic consumption and export.

The authorities should implement policies that are targeted at mass production in agriculture through credits availability to farmers; land use laws and the stability regarding the country's currency.

The results of the study have pointed out the nexus between GDP growth and agricultural exports through the use of correlation analysis technique.

For The Gambia, agricultural export products' competitiveness is identified as a key determinant of export increment. Consequently, it is recommended that policymakers in the agricultural sector should devise value adding mechanisms capable of pulling exports up. Such mechanisms will increase total revenue from agriculture and stimulate local consumption. Also, considering that value added products attracts more value, such a step by policymakers will amount to huge increase

Similarly, the government should ensure that there exist only a small margin between the producer prices and the world prices of the major agricultural export products, as this enables farmers to substantially benefit from international trade.

Furthermore, given that majority of farmers in agricultural export products' production are from the low income ebb of earners in the country, there is lack of financial power for adequate investment in agriculture. The provision of credit or financial aid which could be through subsidy on inputs for farmers, would attract increase in production and enhance to surpluses that can be exported.

REFERENCES

[1]Boansi, D., Odilon Kounabge Lokonon, B., Appah, J. , 2014, Determinants of Agricultural Export Trade: Case of Fresh Pineapple Exports from Ghana. British Journal of Economics, Management and Trade, 4(11), 1736–1754, https://www.zef.de/uploads/tx_zefportal/Publications/bdavid_download_Boansi4112014BJEMT10773_1.pdf, Accessed January 27, 2019.

[2]Gbetnkom, D., Khan, S. A., 2002, Determinants of Agricultural exports: The case of Cameroon. African Economic Research Consortium (AERC). Research paper, (Vol. 120).

[3]GBoS., 2016, Annual Bulletin Development of GDP in 2016.

[4]Gibba, A., 2017, The Competitiveness of Gambia 's Agricultural Products in International Trade: an Incentive for Economic Progress, 1–30.

[5]MoTIE, 2013, The Gambia "Harnessing Trade for Growth & Employment", https://www.enhancedif.org/en/system/files/uploads/the_gambia_dtis_update.pdf, Accessed January 26, 2019.

[6]Ndubuto, I., Agwu, N., Nwaru, J., Imonikhe, G., 2010, Competitiveness and determinants of cocoa export from nigeria. Report and Opinion (Vol. 2), http://www.sciencepub.net/report/report0207/08_3470report0207_51_54.pdf, Accessed on January 31 2019.

[7]NEPAD, 2005, National Medium Term Investment Programme: The Gambia (Vol. I). http://www.fao.org/tempref/docrep/fao/008/af089e/af089e00.pdf, Accessed January 26 2019.

[8]The Gambia, 2007, From Entrepôt to Exporter and Eco-tourism. http://documents.worldbank.org/curated/en/588061468032131638/431320SR0White1ull0report0final0rev.doc, Accessed March 4, 2019.

[9]UNDP, 2012, Republic of The Gambia National

Report 2012. https://sustainabledevelopment.un.org/content/documents/975gambia.pdf, Accessed January 27, 2019.
[10]World Bank, 2018, The Gambia Overview. Retrieved January 7, 2019, from https://www.worldbank.org/en/country/gambia/overview, Accessed December 30, 2018.
[11]Yaffa, S., 2013, Coping measures not enough to avoid loss and damage from drought in the North Bank Region of The Gambia. International Journal of Global Warming, 5(4), 467.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

DEGREE OF WASTE WATER TREATMENT DISCHARGED INTO BORCEA BRANCH

Cecilia NEAGU, Elena LASCĂR, Nicoleta OLTENACU

University of Agronomic Sciences and Veterinary Medicine of Bucharest, Călăraşi Faculty Branch, 1 Nicolae Titulescu, Călăraşi, Romania, Emails: cecilianeagu2005@yahoo.com, elenalascar@yahoo.co.uk, nicoleta_oltenacu@yahoo.com

Corresponding author: cecilianeagu2005@yahoo.com

Abstract

Waste water quality indicators can provide information on the degree of pollution that waste water can have on the rivers where they are discharged. In this study I tried to analyze the quality of the waste water with significant contribution to the pollutants that reach Borcea branch, coming from Călărași Municipality Waste Water Treatment Station. Waste water quality indicators, which can suggest their purification, were: chemical oxygen consume, biochemical oxygen consume, total nitrogen, total phosphorus and suspended solids. The analyzed water quality indicators are included in the limits imposed by the norms in force, namely NTPA 001, but sometimes, because of the thermal regime, with oscillating temperatures and humidity, nitrogen and phosphorus exceed the limits. In the cold seasons of the year, there is a poor functioning of the biological step, leading to a low nutritional nitrogen pollution of Borcea branch. The efficiency of the treatment station, analyzed for the five indicators is good, ranging from 74.78% to 95.24%.

Key words**:** *biological step, efficiency, quality indicator, wastewater treatment, treated waste*

INTRODUCTION

Waste water treatment is the set of physical, chemical, biological and bacteriological processes, which reduces the loading in organic and inorganic pollutants as well as in bacteria for the purpose of environment protection [12]. Waste water treatment requires the use of some advanced treatment processes in treatment plants that use modern, reliable and efficient technologies and equipment to reduce the amount of chemical or microbiological impurities so that these waters meet the quality parameters of the natural waters. Following the physical-mechanical, chemical and biological purification, it results treated water and mud which are then processed to obtain thermal energy.

Treatment methods are classified according to the phenomena based on three categories [10]: physical or mechanical, biological and chemical. The combination of these three treatment phases was designed to achieve increased efficiency to remove the existing impurities, to achieve the parameters recommended by the rules in force and to render them in the surface water circuit. Effective waste water management is essential for maintaining the ecosystem integrity, improving the environment and preserving water quality so that both global and national attention is being given to increase attention to environment protection and synoptic surveillance of the changes in its quality.

About 3,600 million m^3 of water is discharged annually, of which 53% is waste water to be treated [5]. From the total volume of waste water requiring treatment, namely 1,867 million m^3/year, only 561 million m^3/ year were properly treated, namely 30%; 33.13% are un treated waste water and 37% insufficiently treated waste, so nearly 70% of the waste water reached natural receptors, especially rivers, untreated or insufficiently treated.

The average amount of organic substances in domestic water is about 100 g/day/man and contains 1 - 2% phosphorus and 5-10% nitrogen. The emissions of nutrients are 3-4 kg /year/inhabitant for nitrogen and 0.6 - 0.7 kg/ year/inhabitant for phosphorus. The treatment stations provide 90% a removal of organic layer (in primary and secondary), but

in the case of nutrients, the efficiency is about 30%.

Reached the surface waters, the residual content of nutrients can lead by photosynthesis to form new organic compounds. By means of sedimentation, mineralization and resolubilization processes, the nutrients can form up to 140 g of organic substance/man. When compared to the 90 g/man removed by conventional treatment technologies, it can be seen that without an additional step of nitrogen and phosphorus removal, these technologies are ineffective [6]

The most important water resources of Calarasi county are Borcea branch and, of course, the Danube River. Over time, these waters were polluted by the waste water that has reached them. Consequently, it is very important to estimate the current impact of these waste waters on the two surface waters.

In recent years, Calarasi county has made great steps in infrastructure development in the water and wastewater sector. The "Master Plan" was elaborated, identifying the necessary investments for the infrastructure development, phased over 20 years, until 2026.

MATERIALS AND METHODS

In this paper we analyzed: the treatment technology used in Călăraşi Waste Water Treatment Station, loading of waste water from Călăraşi with pollutants, the efficiency in the treatment of waste water at the station, and last but not least, the quality of the water discharged into the emissary (Borcea branch) then into the Danube.

The data collected come from Călăraşi Agency for Environment Protection, which analyzes physically and chemically the waste water that reaches the emissary.

The length of the water supply network in Călăraşi county is as follows [2]: in the urban area, the length of the water supply network is 269.90 km (connecting 83,863 inhabitants, namely 66.98% of the total population); in the rural area, the water supply network is 936.2 km long (serving 119,223 inhabitants, namely 62.3% of the total population).

The population served in Călăraşi is 70,152 inhabitants (97%), the source being the Danube River, through a distribution network of 138.65 km length. There are network losses of 53m^3/ day and the population counting is 86.49% [1].

Starting with 2012, following the implementation of the European project "Extension and rehabilitation of water supply and sewerage systems in Călăraşi county", co-financed by the Cohesion Fund under the "Environment" Sector Operational Programme, Călăraşi county has an efficient Waste Water Treatment Station, which observe the standards of the European Union.

Fig. 1. Călăraşi Treatment Station
Source of data: Călăraşi Treatment Station.

The technological process of sewage treatment at Călăraşi Waste Water Treatment Station consists of three stages: mechanical, biological and chemical. The mud treatment and its fermentation are followed, obtaining biogas. Two anaerobic fermentation tanks with a volume of 1,200 m^3 each are available for mud fermentation. The retention time of the mechanically thickened mud in the fermentation tanks is about 20 days. The calculation temperature is about 36^{o}C.

Călăraşi Waste Water Treatment Station is designed to operate with a water flow of maximum 21.800 m^3 per day and respectively 7,957,000 m^3/year. The influent waste water at Călăraşi Waste Water Treatment Station, come from the population, from the companies, public spaces, losses, infiltrations.

Treatment degree (GE) is defined as the efficiency achieved by the treatment station in the percentage reduction, of a part of the

pollutants in the waste water, so that the part remaining in the treated water represents the admissible limit value [11].

According to the definition, the treatment degree is established with the relation:

GE = (Ci-Cf)/Ci * 100 where:

Ci - represents the initial concentration of the influent indicator in the waste water (mg/l);

Cf – value of final concentration (effluent) of the same indicator after waste water treatment (mg/l).

In order to estimate the degree of waste water treatment entering Borcea branch, we analyzed in this paper, during 2018, the variation of the most important qualitative parameters of the waste water discharged. These were: total nitrogen, total phosphorus, suspended solids, biochemical and chemical oxygen consumption.

They were compared to the maximum admissible value according to NTPA001 [4].

RESULTS AND DISCUSSIONS

During 2018, the variations of waste water influent indicators and the effluent resulted from the discharge to Treatment Station recorded the following variation which shown in Table 1.

Table 1. Biochemical and chemical consumption of oxygen in the waste water and treated in Calarasi Treatment Station, in 2018

Period	CBO_5 (mg/l)		CCO-Cr (mg/l)	
	Infl.	Efl.	Infl.	Efl.
01	176.84	6.63	333.94	38.45
02	178.98	10.12	326.36	47.76
03	180.23	9.51	342.28	47.76
04	169.44	6.62	279.24	36.62
05	157.59	5.58	305.03	30.80
06	148.70	5.37	307.31	43.51
07	150.11	5.77	279.73	34.18
08	139.81	3.22	320.52	38.06
09	145.90	4.31	268.08	37.76
10	161.35	5.03	277.32	40.18
11	199.01	4.79	278.93	31.52
12	182.56	4.55	241.96	26.50
Annual average 2018	**125.05**	**5.95**	**296.72**	**37.75**
G.E.	**95.24%**		**87.27%**	

Source: Călăraşi Treatment Station (database)

We can see in Table 1 that the efficiency of Treatment Station regarding the two parameters is over 87%.

Table 2. Total nitrogen, total phosphorus and suspended solids in the waste water and treated in Calarasi Treatment Station, in 2018

Period	Ntot (mg/l)		Ptot (mg/l)		SS (mg/l)	
	Infl.	Efl.	Infl.	Efl.	Infl.	Efl.
01	45.42	5.84	4.30	0.94	199.68	22.41
02	43.06	16.45	4.10	1.13	187.04	27.29
03	42.91	20.13	3.79	0.30	188.34	26.16
04	38.20	7.26	4.30	0.32	201.31	30.66
05	36.05	7.94	4.58	0.59	193.89	30.55
06	41.80	9.00	4.50	0.46	197.45	26.96
07	40.80	9.03	4.42	0.66	207.52	31.52
08	50.01	10.6	5.12	2.55	205.78	25.79
09	46.41	8.17	5.02	1.79	199.02	24.26
10	39.88	9.95	4.97	1.93	222.25	23.19
11	37.94	7.95	4.85	1.40	197.03	23.23
12	32.09	6.34	4.79	1.82	195.77	22.77
Annual average 2018	**41.21**	**9.88**	**4.56**	**1.15**	**199.59**	**26.23**
G.E.	**76.02%**		**74.78%**		**86.85%**	

Source: Călăraşi Treatment Station (database)

From Table 2 we can see that the nutrient loading (nitrogen and phosphorus) of the discharged waste water is higher, the efficiency of the station being 76.2% for nitrogen and 74.78% for phosphorus. A much better treatment degree is observed for solids in suspension (86.85%).

The concentrations of the influent load parameters of Călărasi Waste Water Treatment Station are: CBO_5 - 275 mg/l; CCO-Cr - 410 mg/l, Ntot - 46 mg/l, Ptot – 7 mg/l; SS – 320 mg/l [3].

Analyzing the biochemical oxygen consumption (CBO_5) in the water evacuated to the emissary in 2018, we noticed the evolution which is presented in Fig.2.

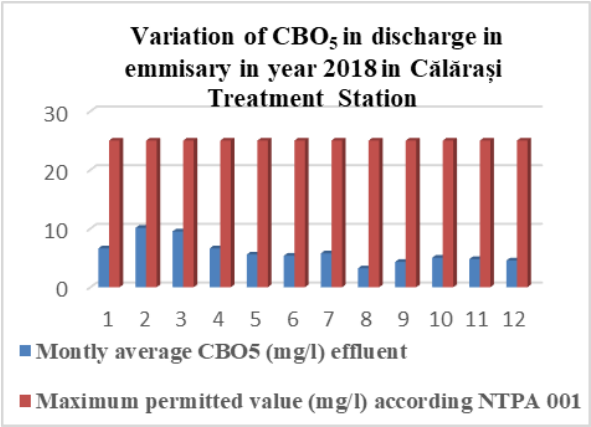


Fig. 2. Variation of CBO_5 in discharge into emissary in year 2018, in Călăraşi Treatment Station

Source: Călăraşi Treatment Station (database)

According to the data in Table 1 and Figure 2, you may note that the highest value of CBO_5 effluent was in February 2018 (10.12 mg/l).
The quite large variation in biochemical oxygen consumption during 2018 can be attributed to the influent flow or the variable weather conditions recorded. However, the values of this parameter were well below the maximum admitted by NTPA001 (25mg/l).
The evolution of the chemical consumption of oxygen during the analyzed period is shown in Fig.3.

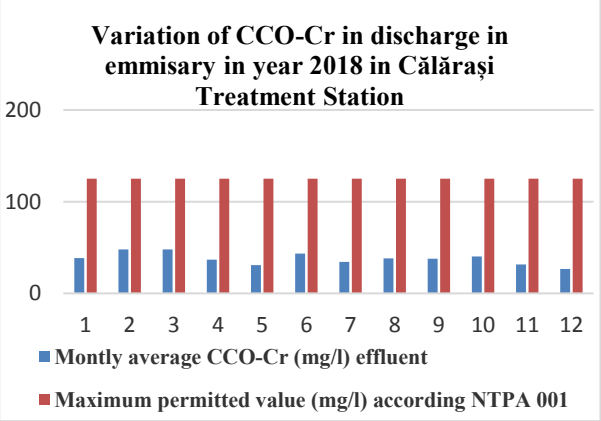


Fig. 3. Variation of CCO-Cr in discharge into emissary in year 2018 in Călărași Treatment Station
Source: Călărași Treatment Station (database)

In the case of the chemical consumption of oxygen effluent emission in the emissary (CCO-Cr), as shown in fig. 3, its values fluctuated in 2018, the highest value being recorded in February and March, namely 47.76 mg/l, but this is well below the limit required by NTPA001 (125 mg/l).
The total nitrogen values (Ntot) effluent in the emissary, recorded in 2018 the levels shown in Fig.4.
We can see in Figure 4 the exceeding of the total nitrogen values (15 mg/l) in February and March, with 1.45 mg/l (9.66%) and respectively 5.13 mg/l (34.2%). Certainly, this exceeding may be due to too low temperature of the waste water at the entrance to the Waste Water Treatment Station (average temperature 6-7^{0}C, min. 3-4^{0}C). Increasing the concentration of nitrogen in the effluent can be attributed to the decrease in the intensity of the biological processes (which at these temperatures are largely slowed down) and thus, to a decrease in the biodegradation efficiency of the organic compounds. [9]

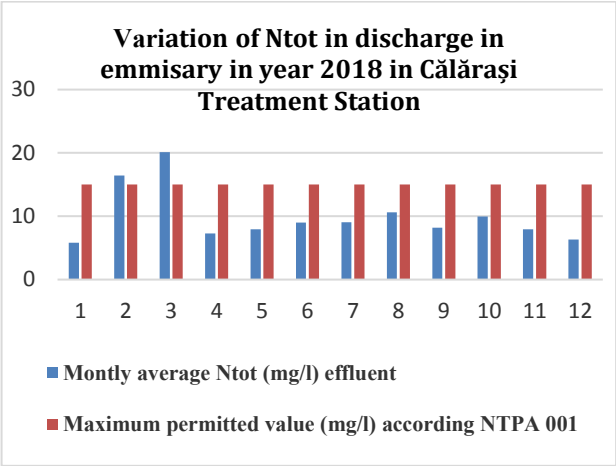


Fig. 4. Variation of Ntot in discharge into emissary in year 2018, in Călărași Treatment Station
Source: Călărași Treatment Station (database)

Regarding the phosphorus content of the treated water in Calarasi Waste Water Treatment Station, its dynamics is presented in Fig.5.

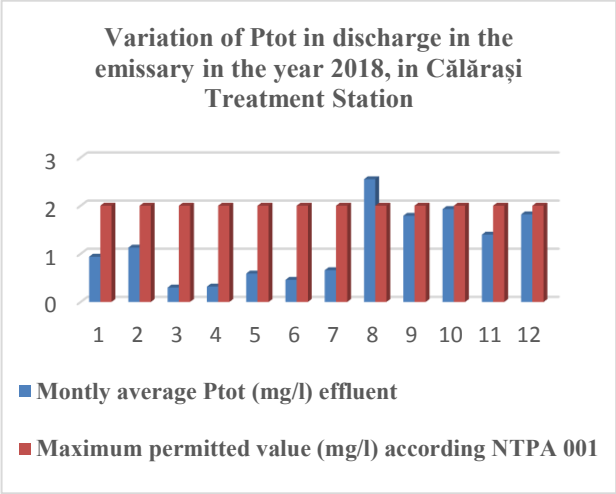


Fig. 5. Variation of Ptot in discharge in emissary in year 2018, in Călărași Treatment Station
Source: Călărași Treatment Station (database)

The amount of total phosphorus evacuated in the emissary in 2018, as seen in Figure 5, exceeds the maximum admissible value according to NTPA001 of 2 mg/l in August 2018 by 0.55 mg/l (27.5%).
The increased value in August 2018 is due to the increase of the influent flow, but the concentration of the waste water was weaker, thus, the microorganisms, with insufficient

consumption substance, the biological process of phosphorus removal was negatively influenced [8].

Regarding the solid particles in suspension, during the studied period they recorded the variation presented in Fig.6.

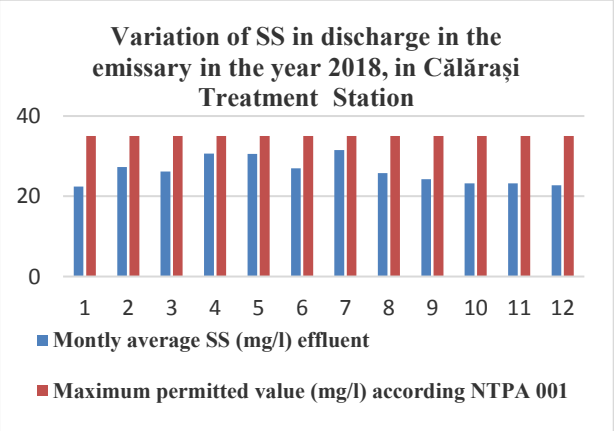


Fig.6.Variation of SS in discharge in emissary in the year 2018 in Calarasi Treatment Station.
Source: Calarasi Treatment Station Database.

Solids in suspension evacuated in the emissary in 2018 record oscillating values, the highest level being in July (31.52mg/l), as we can see in figure 6, but it is within the maximum admissible value according to NTPA001, of 35 mg/l.

CONCLUSIONS

The study elaborated in Călăraşi Waste Water Treatment Station on the main indicators responsible for the quality of treated and discharged waters, namely the biochemical oxygen consumption (CBO_5), the chemical oxygen consumption by oxidation (CCO-Cr), the total nitrogen (N_{tot}), the total phosphorus P_{tot}), solids in suspension (SS), aimed at highlighting the level of waste water contamination in Călăraşi county.

The main nutrients that cause eutrophication are ***phosphates*** and ***nitrates***. Nitrates come from agriculture and animal breeding, and phosphates mainly from detergents, from chemicals used to combat corrosion. Other sources of origin are: transport, population or mud resulting from waste water treatment and deposited on the soil.

Based on the analysis carried out, we can conclude the following:

- over 2018, the real loading of the station influent is lower than the designed one, as follows:
  - ➢ biochemical oxygen consumption (CBO_5) by 55%;
  - ➢ chemical oxygen consumption by oxidation (CCO-Cr) by 28%;
  - ➢ total nitrogen (N_{tot}) by 10%;
  - ➢ total phosphorus (P_{tot}) by 35%;
  - ➢ solids in suspension (SS) by 38%.
- the quality indicators of the waste water at the entrance to the station are within the limits required by the current legislation on the quality of the waste water discharged into the sewerage network or directly into the treatment station.
- the quality indicators of waste water discharged into the emissary are within the limits required by the norms in force, respectively NTPA 001, except for total nitrogen in February-March 2018 and total phosphorus in August 2018.
- the efficiency of the treatment station analyzed for the five indicators is good, varying from 74.78% to 95.24%.
- the difficult operation of the biological step in the winter months due to the too low temperature of the waste water entering the Waste Water Treatment Station, which leads to the reduction of the biodegradation efficiency of all organic compounds and thus to the increase of the nutrient concentration in the effluent: nitrogen and phosphorus - knowing that they are the basis of eutrophication. [7]
- during the cold periods, a malfunctioning of the biological step is recorded with the following consequences: heavier fermentation of the mud, high energy consumption, production of a smaller amount of biogas.

Călărași Waste Water Treatment Station operates on the basis of mechanical, chemical and biological processes, as well as mud treatment and fermentation processes in order to obtain biogas and fertilizer for agriculture.

The smooth running of these processes must be ensured by conscious exploitation and maintenance.

In order to preserve the quality of surface water, it is essential to evacuate chemical wastewater, without nutrients. Only in this way the integrity of ecosystems and a clean environment can be maintained.

A solution for the problems identified in Călăraşi Waste water Treatment Station would be the production during the cold season of a higher amount of biogas and electricity from the resulting organic mud - by stimulating the biological step, with the inoculation of microorganisms.

REFERENCES

[1]Călăraşi County Agency for Environment Protection, Annual report on environment factors situation in Călăraşi in 2018.
[2]Călăraşi County Council – County Strategy for Accelerating the Development of Community Utilities Services 2014-2020.
[3]Călăraşi Treatment Station (database) (2018).
[4]Directive 91/271/CEE on urban wastewater treatment.
[5]Drucker, P., 1999, Realities of tomorrow, Teora Publishing, Bucharest, p.35
[6]Manolache, L., 2003, Poison in the water, the Scientific and Enciclopedic Publishing, Bucharest, p. 47
[7]Neagu Cecilia Violeta, 2013, Sources of eutrophication of the waters in Calarasi county-Scientific Papers Series "Management, Economic Engineering in Agriculture and Rural Development", Vol 13(1): 257-262.
[8]Neagu Cecilia Violeta 2014, Degree of Water Eutrophication in the Terminal Basin of the Danube. Case Study – Bulletin of the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca – Agriculture 71 (2), 274-281.
[9]Neagu Cecilia Violeta, 2016, Quality of treated water in Călăraşi Municipality, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development", Vol 16 (4) 235-238.
[10]Oprean, L., 2012, Water-basic resource of sustainable development, Vol. I, The Romanian Academy Publishing House, Bucharest, p. 42.
[11]Panaitescu, M., 2011, Techniques for waste water treatment, Guideline to establish treatment station, Nautica Publishing, Constanța, p. 37
[12]Robescu, D., Gheorghe B., 2000, Waste water treatment, Bren Publishing, Bucharest, p. 29.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

METHODS TO INCREASE EFFICIENCY OF MANAGEMENT AND AUDIT INSTRUMENTS TO CONTROL ANIMAL DISEASES IN CRISIS SITUATIONS

Mirela Daniela NICOLA, Dorina Nicoleta MOCUTA

University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Emails: mireladanielanicola@gmail.com, dorinamocuta@yahoo.com

Corresponding author: dorinamocuta@yahoo.com

Abstract

*Animal health is **a** considerable importance for humans. Animal diseases have a significant impact on human health (ie if there are zoonosis.), or they are producing food decline production, on the economy (direct and indirect costs) and on the trade of a country/countries (changing the trade policy regime, such as in the case of three major outbreaks diseases – Bovine Spongiform Encephalopathy (1992,when spiked) and Classical Swine Fever (detected in 1997, first in Netherland**s**) in Europe, Food and Mouth Diseases (nine years of Taiwan negotiation) in Asia. Generally, they are affecting mostly the less developed countries where because of the poverty and the economic vulnerability have /not invested in infrastructure (small farms), technology and research. The world has been and will be always surrounded by all kind of new diseases that today are subject of debates at international level (OIE, WTO, European Commission, CODEX or other scientific groups, etc). With the entire policies, preventive and control measures taken up to now, we are still facing up to new challenges such as÷ contagious nodular dermatosis, avian influenza, small ruminant pests, African Swine Fever etc. Or, science does not have all the time the answers in a magic bag to the challenges raised by the animal health crisis. So, the aim of my paper is to collect information old and current about politics, crisis management of the Animal Health Diseases, major disease outbreaks data (USA, Europe - Romania, Australia, Africa etc) and by analogy and comparison to look for new links between different factors in order to enrich the knowledge about the practical tools for the management of infectious disease in livestock during crisis.*

Key words**:** *animal health, crisis management, economy, trade, zoonosis*

INTRODUCTION

This article is looking **to review the traditional and current practices** in order to control crisis in human and veterinary health, since old times (antiquity) up today.

The article also refers to **management of the crisis**. In short, the philosophy of the management has developed somewhere in the **1800s**, but literature quote that the earliest strategists of management were Sun Tzu (545 BC-496 **BC)**, Machiavelli (1469-1527) and many others until 1800, etc. In this sense, we will also deepen the knowledge concerning the current systems of management for animal health developed in the world (Europe – European Commission, OIE and WTO-International organisations etc) [11,20].

We would like to stress that in order to control critical situations as effectively as possible; managers have to have instruments / methods in place **to allow them** to take correct decision at the right moment. Literature shows that today there are many concepts and methods developed. The ones that belong to **the XXI century** are very sophisticated (modelling simulating a crisis management system, risk assessment etc) and are staying at the origin of politics and management decisions.

However, recent experiences show that **theoretical models are not equal to reality** (see **BSE -1980, tuberculosis a world emergency in 1993, AI H1N1 pandemic** episode - **2009**, **ASF** crisis in EU, **2014-2019** etc) [9.12.20]. Therefore, we have to agree that the existent theoretical models cannot cover all diseases and moreover new diseases in general overcome **the theoretical models** developed by humankind.

So, summing up the paper list in

chronological order **the milestones of the management of animal health crisis over centuries** and highlights where is possible their strength or their weaknesses. We are also looking to identify a more realistic management approach for decisions making system, in order to reduce the negative impact of diseases on the economy, society, environment and politic system of the world.

MATERIALS AND METHODS

In order to assess the control systems for animal health we proceeded to collect and review a great deal of bibliographic data, legislative, reports, scientific materials available, from all the times and all organisations involved in the animal health control over time and today (OIE, WTO, FAO, European Commission, EFSA etc) Competent Authorities websites from Europe, USA, Australia, Africa etc, high level intergovernmental forum, non-governmental organisations, scientific and others international bodies.

We pull out the iconic moments over time concerning management and the control and the eradication of epidemics /epizootics /pandemics that affected the population of humans and animals from antiquity to present day.

We conducted a comprehensive comparative bibliographic study on different periods and stages, and we give emphasis to to the EU Institutions (primarily European Commission, EFSA) including the new EU animal health legislation.

In view of the very close link between both animal health and public health, we considered that it is appropriate to present a situation relating to both branches of human medicine and veterinary medicine. We also considered that it is necessary to compare the evolution of the others sciences because they supplied the means for fighting and eradicating epidemics / epizooties /pandemics at international level.

In the end, the article encompasses information from a variety of crisis control approaches from the past to near present, international or indigenous knowledge.

RESULTS AND DISCUSSIONS

All the literature reviewed shows that the origins of human and veterinary medicine have **very deep roots in the history of mankind** – it started with the domestication of the first animal and with the first attempt to treat animals, it started with the first description of disease symptoms (such as the papyruses from Greece). As literature describes, the first animals to be domesticated for food are thought to be sheep (11,000 and 9,000 B.C. in Asia). Then goats followed, around 8,000 BC. Archaeological evidence revealed that trepanation was performed over a cow skull during **the** Neolithic period (3,400-3,000 BCE) and the first veterinary record belongs to the twelfth Dynasty of Egypt, namely the Egyptian Papyrus of Kahun [11,20].

Reviewing the literature is evident**ly** clear that **many of the discoveries in both disciplines human and veterinary medicine,** during **the** time, were and are **due** to the development of **other disciplines** such as **genetics, archaeology, history, art, literature, technology information**.

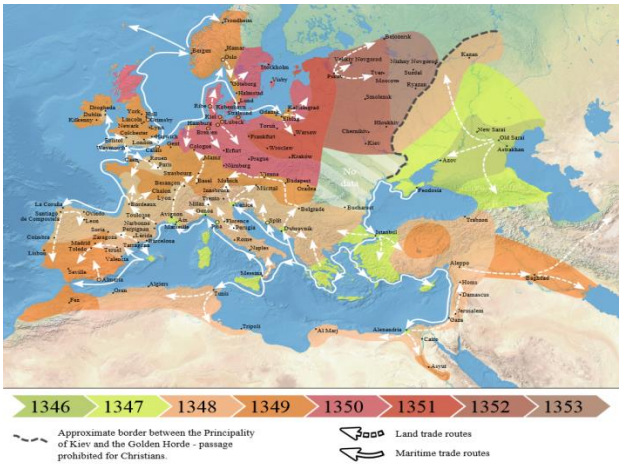
Literature shows that in the beginning critical events (such as pests, cholera, smallpox etc) on human and animal health, **practical aspects especially necessity (producing food)** have been the **trigger factors** for the first individual treatment trials, which later turned into studies, researches of several personalities or multidisciplinary teams, resulting into effective methods of combating and eradicating some major diseases with epidemic/epizootic and pandemic evolution. Th**en** m**any other challenges along centuries** (zoonosis, **foodborne** outbreaks, **the** appearance of pandemic episodes) **led** to the development of new concepts and new disciplines of investigations-epidemiology, genetics, risk assessment, molecular biology, digital device input as a support for research, management disease etc. The emergence and evolution of communicable diseases from animals to

humans and vice versa have **motivated** all mankind involved - farmers, practitioners, and joint scientific researchers to work together and to discover new treatments, new means of prevention and eradication, even the consumers. Then t**he rapid changes and the increased complexity of today world** put new demands on **mankind who** embraced new and different strategies. They realize that **a** single uniform approach cannot be applied in order to obtain significant improvements **in** the management of diseases - so they moved on to new concepts such as "/emergency planning for controlling infectious animal diseases"[1,3,4,6,7,8, 13,20] - widely recognised around 1990, such as *"Prevention is better than cure"(the 2007-2013 EU Strategy), or "One Health" (2008 - a multidisciplinary collaborative approach to solving global and environmental health challenges CDC, USA), or The OIE Sixth Strategic Plan (2016–2020) [11,20]*.

The earliest theories and concepts, in **antiquity**[11.12.20,21,23] about the disease / the fight against epidemics / epizootics/pandemics were launched by **pioneers** who experienced unknown diseases, until they attempted to treat individuals of a particular disease (4,000 BC - 476 AC). Summing up, the state of knowledge at that time was resumed to **observation -** the **first tool of research,** to **description** of the diseases or symptoms of episodes of illness (papyrus - first time Greeks) and **generation of hypotheses** about phenomena such as *transmission of diseases, possible precautions / prevention and control*. In this context, there are countless papers and articles about the ***black time in the history of mankind***. [11,20]

Almost all writings generally converge in the same direction that the **epidemiological thinking seems to begin with Hippocrates** (460-360, that is). Through his work "About Air, Water and Places" (460 years BC), he is considered that he shifted from **mysticism to the concept of preventive medicine** based on scientific demonstrations. **Hippocrates is considered the parent of human and veterinary medicine** and is the **first epidemiologist** of the antiquity, of the world [11,12,20].

Middle Ages (200 / 600-1500 / 1700) [9.12.20,23] brought new episodes of illnesses, some with endemic evolution, others occurring in the form of epidemics. Plague **is** considered to be the most devastating disease in the history of mankind.



Source: Maps by O.J. Benedictow[11,20]

Table 1. The impact of different pandemic episodes in the world (541-1665)

TIMELINE	IMPACT
Justinian's plague 541-542	25–50 million people in two centuries of recurrence, equivalent to 13–26% of the world's population at the time of the first outbreak
Bubonic plague Europe 1347	a third and a half of the European population died in a few years
Plague London 1665	100,000 dead people / 18 months,
Plague Milan 1629/31	60,000 dead people from about 130,000
Variola in Japan (735-737)	decimated 25-35% of the population
Leprosy (especially in the Scandinavian countries)	were two serious transmissible diseases in humans
syphilis (France-sixteenth)	
unidentified epidemics, China1641	80-90% mortality population
epidemics in America brought by Europeans (1500-1550)	population in Peru and Mexico decreases from 60 to 10 million

Source: [9.12.20]

Following these atrocious experiences, the curiosity of the mankind combined with human intelligence seems to lead to **the** crystallization of **new scientific concepts / theories / discoveries** and the removal of others. Thus, there is evidence that **the first vaccination** attempt dates back to 1000 CE **in**

China, such as inoculating smallpox material by scratching the skin. The **concept of quarantine** is shaped somewhere in the fourteenth century. The term "quarantine" originates from the Italian words "quaranta giorni", which means 40 days. The vessels coming from infected areas were obliged to stand for 40 days in the open before embarking in the port. In order to assess the severity of epidemics - **the first systematic / statistical record of biological events is written** by John Graunt (1620-1674). Records were existing before John Graunt, since 1592, but they could not be used because they were discontinued and therefore were not sufficient to conclude. John Graunt, (April 24, 1620 - April 18, 1674, London), was an English statistician and is considered **the founder of demographic science**.

Mathematics is applied for the first time in biology in the twelfth century by Fibonacci. It uses the so-called **"Fibonacci series"** to describe the rabbit population.

Around **1590,** mankind discovers a new world of living things in the water, in and around them, thanks to the **invention of the microscop**e. The Italian physician Francesco Redi provides **scholarly evidence** (**1668**) against the spontaneous generation theory (an outdated Aristotelian concept) claiming that some living organisms are born of dead matter. The year **1670** brings a **pioneer in microbiology**- Anton van Leeuwenhoek who observed directly the microorganisms. This novelty arises after the discovery of Athanasius Kircher, who was seeking treatment when Rome was struck by bubonic plague in 1656. Based on new experiences and observation, starting with **1546, the theory of transmissibility** gains new valences. The Italian researcher and practitioner, Girolamo Fracastoro, in his book De Contagione et Contagiosis Morbis, points out that the diseases are caused by transmissible organisms, which he calls all seeds (seminaria morbi) that transmit infections by direct or indirect contact or even without contact over long distances. Based on Leeuwenhoek's work, physician Nicolas Andry claims in **1700 t**hat the microorganisms he calls "worms" are responsible for triggering diseases. In **1762,** Austrian physician Marcus Antonius von Plencze (1705-1786) published a book entitled "Medical-Physics Opera". He develops the **theory of contagiousness** which states that certain animals present in soil and air are responsible for causing specific diseases. Furthermore, **Von Plencis** distinguishes diseases that are both epidemic and contagious (such as measles and dysentery) from diseases that are contagious but not epidemic (such as rabies and leprosy). Finally, von Plenczi's theory was not accepted at the time by the scientific community.

Modern Age (1700-1900): plague, smallpox, and tuberculosis **continue in modern age.** Moreover, **new diseases** are emerging: typhus, yellow fever, influenza, measles, dengue fever, typhus [11,12,20,21,23].

Humanity continues to become **more aware of the microorganisms.** New innovations are developing. Mankind begins to establish **rules, even legislation to control them**. In 1796, Edward Jenner uses the smallpox infectious material and creates the **smallpox vaccine**. **The technique spreads rapidly around the world**. His method experienced technological changes over the next 200 years **and ultimately led to the eradication of smallpox (1980)**. In Europe, the **tuberculosis disease** rate began to rise at the beginning of 1600. In 1815, in England, one in four people died of "TB". Hermann Brehmer opens **the first TB sanatorium in 1859** in Sokołowsko, Poland. Bacillus, Mycobacterium tuberculosis, was discovered on March 24, **1882** by Robert Koch. For this discovery, Koch received the Nobel Prize for Physiology and Medicine in 1905. However, Koch did not think there was a link between tuberculosis in cattle and tuberculosis in humans. For this reason, infected milk was not considered at that time a source of infection. Subsequently, the risk of transmission from this source was significantly reduced due to the introduction of the **pasteurization process** (April 20, **1862**). In 1890, Koch claimed that a certain glycerin extract from tuberculosis bacillus constitutes the "cure" against tuberculosis. He

called this extract **"tuberculin".** Although "tuberculin" proved to be ineffective, it was adapted as a **screening test** to identify the presence of the disease in the pre-symptomatic phase. [9,12.20] Albert Calmette and Camille Guérin recorded their first success in **tuberculosis immunization in 1906**. They used a mitigated strain of bovine tuberculosis bovine to create a vaccine they called **the BCG vaccine** (Calmette and Guérin's bacillus). The BCG vaccine was first used in humans in France in 1921. On the other hand, the BCG vaccine was widely used in the United States, Great Britain, and in Germany only after the second world war. Tuberculosis has created deep concern in the nineteenth and early twentieth centuries, **is** considered an endemic disease of the poor urban population. After scientists established around the year **1880**, that the disease was contagious, tuberculosis was included in a list of **disease-obligatory notifiable** diseases in the UK. **Campaigns** have begun to persuade people not to spit in public places, and poor infected people are "encouraged" to go to sanatoriums that resemble prison rooms. (**Sanitary facilities for middle** and upper classes provided excellent health care services.) . Sanitaria were supposed to offer the advantages of a clean air environment. But even under the best conditions, 50% of those interned died in the next five years (about1916). In 1918, in France, one in six people died of tuberculosis. Until 1950, the number deaths decreased by almost 90%. **Changes in the public health system significantly reduced the incidence of tuberculosis** even before streptomycin and other antibiotics began to be used. Even under these conditions, the disease remained a serious threat to public health. At its establishment in 1913, **the UK Medical Research Council focused on tuberculosis research**. In 1946, the development of the antibiotic called streptomycin in fact transformed effective treatment and healing of TB patients. Prior to the introduction of this medicine, the only treatment (except sanatoriums) was surgical intervention. Although specialists have been hoping to completely eliminate tuberculosis (see pox), **the emergence of drug-resistant strains around 1980** has made eradication of tuberculosis less likely. The subsequent recurrence of the disease has prompted the World Health Organization (WHO) **to declare tuberculosis a world emergency in 1993** [9,12.20].

In **1878** the pressure exerted by typhus, cholera, and yellow fever brought by immigrants on the vessels determined the **United States to adopt the first federal law on quarantine** [11,12.20].

In 1900 Walter Reed discovers the **first insect-transmitted yellow fever virus**. The disease originated in the African region spread to South America through the trade of slaves (17th century). Since the 17th century, several epidemics of this disease have occurred in America, Africa and Europe. In the 18th and 19th centuries, yellow fever was regarded as one of the most dangerous infectious diseases. A new image of the plague appeared in the 18th century for Western Europe and the nineteenth century for Eastern Europe.

Plague begins to strike again and at regular intervals, almost every decade: France 24 appearances between 1437 - 1536 and 12 in the period 1536-1670, the whole Europe in 1576, 1585, 1628, 163, 1720. The largest impact of this disease was paid by Florence, where 50% of the 110,000 inhabitants died (1338), Hamburg, where 66% of the population was decimated in 1343-1357, and Paris where 40,000 people died in 1450, and in Naples (1656) half of the 450,000 inhabitants died. The last outbreak in Marseilles made 50,000 victims out of its 100,000 inhabitants. Neither England was exempted from this killing disease. In 1665 there was a terrible epidemic that seizes a sixth of the United Kingdom's population, out of which only 68,000 were in London. The city was "saved" by a devastating fire bursting in 1666, leading to the killing of rats. The writings of that time describe a sinister painting of mankind touched by the plague. People took unnecessary measures such as spraying vinegar letters and money, sparkling fire-fighters at the intersection of roads, the

disinfection of houses with perfumes and briquettes, city dwellers wandered in the streets with bird-headed masks, their beak filled with aromatic plants and spices to alleviate stench. And this, because a medieval prejudice considered the plague to be widespread by birds. Other measures were taken wrong so that in London all dogs and cats were killed, rat colonies proliferating, which led to the intensification of the plague. The prescriptions prescribed by the doctors were primitive and therefore the patients suffered uselessly. Daniel Defoe reports in "The Plague Journal" as doctors thought they were defeating the disease if they cauterized purulent swellings (tumors) and recalcitrant tumors. He mentions that some bubbles were so strong they could not be opened with an instrument, so they were cauterized, many patients dying of pain. The contemporaries capture the hallucinatory spectacle offered by the plague. Marseilles is the scene of a total disaster in the 1720s. "The damaging mudslides flow from the houses where the corpses rot and rise from the streets full of mattresses, bedding, laundry, rags, and all kinds of lean waste. The graves filled with corpses reveal hideous bodies, some swollen and black like beads, blue, eggplants and yellow, all cracked and cracked, rotten blood, "writes Jean Delumeau in" Fear in the West: 14th Century, a Fortress besieged ".

Fig. 2. Plague Costume, 1720. Contemporary engraving showing the costume worn by physicians during the plague at Marseilles, France, in 1720
Source: Photography by Granger) [11,12,20]

Epidemics had a devastating psychological impact on survivors. The inhabitants rushed out the crowded towns. In London, 200,000 people **left** the city and wander through the forests, without having anywhere to sleep, without food and water, only with their clothes. Those who remained barricaded themselves in the houses knocked the windows and nails and try to resist alone. If one of the family members was ill, then it was quickly isolated, and when was dying, the corpse was pulled out of the window with ropes, from where it was taken up with some hooks, put in trolleys and taken to the common pits. As soon as the plague died down, people were returning to life.

In 1738, 23 districts in Transylvania were contaminated and 41,000 people died. In the same year, during the third reign of Constantin Mavrocordat, the pestilence ravaged 30,000 people in Bucharest".

During the **eighteenth century,** Daniel Bernoulli studied the **smallpox** on the human population in order to describe the evolution and the laws that govern the disease. **This created the first statistical model of the disease** (epidemiology / probability theory). They were heated debates at that time about variation. His approach was to calculate the increase in life expectancy if the pox could be eliminated as a cause of death. More recently, its approach has been generalized (**Dietz & Heesterbeek, 2002**). Another valuable contribution to the understanding of infectious diseases was the study of **the temporal and spatial model of cholera** cases in London by John Snow (1855). He was able to identify that the water pump was the true source of infection (Johnson, 2006; Snow, 1855). In 1873, William Budd manages to identify similarly how the typhoid fever spreads (Budd, 1873). Into the1840, William Farr uses probability calculations to study epidemics in order to discover the laws governing the amplification and extinction of epidemics (Farr, 1840, pp.**).** In 1664, Sollysel (France) states that morva is a very contagious disease, although its etiology is established only in 1882, when the bacillus (Burkholderia mallei) is isolated from a horse that died. At the beginning of the nineteenth century, the transmission of disease from dead horses to

humans was demonstrated in Europe, where the disease persisted for many centuries, especially among the horses of the army.

Analyzing the contemporary age (1900 up to now), it turns out that mankind fight with the microorganisms continues. It seems that microorganisms are evolving and that they often go beyond mankind's ability to prepare [14].Despite lessons learned and new discoveries, the world is still not ready to deal with microorganisms.[9,23]

Contemporary age, like the other stages described, is characterized by the emergence and evolution of other devastating pandemics such as exanthema (1907, the United States), influenza (1918-1919, United States) cholera (1910-1911, Napoli).

Population displacements and agglomerations caused by wars constituted factors favouring different outbreaks (**typhus** at the end of the First World War - over 3,000,000 dead in Eastern Europe, i**nfluenza** / all over the globe, resulting annually in between 3 and 5 million severe illnesses and 250,000 and 500,000 deaths). **The first influenza pandemic of the 20th century is the Spanish flu of 1918**. It was a type of flu that emerged during World War I, and it seems, that is similar to avian flu disease today. It has reached many countries with the return of soldiers on the front, mainly affecting young people and having a high mortality rate that decimated between 50 and 100 million people worldwide between 1918 and 1919. It is believed to have been one of the most lethal pandemics, after "Black Death," in the history of humanity.

After 1945 others several serious diseases such as poliomyelitis (1945-55, USA), cholera (1961-present), AIDS (1980-USA), influenza (Asian flu in 1957 with 2 million the 1968 Hong Kong flu with one million deaths), transmissible spongiform encephalopathies (EST 1985 - today), malaria and tuberculosis, affected mankind.

David Griffin and Justin Denholm write an article on **July 9, 2017**, where they mention that four of the diseases of the contemporary world with which mankind had to deal, and for which preventive treatment and treatment have been identified, are still a problem today. These are **tuberculosis, smallpox** (recently eradicated), **AIDS** and **influenza**. Their article illustrates how internationally management allowed effective control of disease outbreaks / pandemics (eg eradication of smallpox, decreasing rates of occurrence of diseases). The authors note that **we need to learn from past pandemic lessons [10], to** appreciate the value of international collaboration, the perseverance, and commitment to humanity. Emphasizes that each of all these enumerated diseases **is** produced by very different etiological agents and as such our responses to them are very different. In part, this is also due to the social context in which these diseases occur and evolve, with a critical role. The authors mention in their article that tuberculosis (or TB) was responsible for the death of more people than any other infectious disease in history; **over one billion deaths over the last 200 years, that its origin is still unclear, and that it infects other species, such as bovines (swine, birds). Today, about a third of the world's population is considered to be infected with TB in its latent form. This means that the bacterium is present, but is controlled by the immune system, the infected person has no symptoms and can not be spread to others.** At the same time, the authors point out that while much progress has been made, ***continued and increased political and financial support is essential [10] to ensure coordinated diagnosis and management strategies, supervision and care and universal access to them.*** Similarly, financial investment is needed to develop new tools and tools **for the detection and treatment of tuberculosis**. With regard to TB, it has been one of the catastrophes of mankind, killing and destroying a huge number of people throughout the centuries; only in the 20th century died between 300 and 500 million people. In 1967 some 15 million people fell ill. In the same year, the World Health Organization has carried out an intense campaign to vaccinate and inform the public about this disease.

In 1977, the smallpox was completely eradicated and no case has ever been reported

since then. They also note in this article that in 1980, **smallpox is the first human infectious disease that has been declared eradicated by the World Health Organization**. This was due to an international activity coordinated by Australian microbiologist Frank Fenner. Mass vaccination, together with public health surveillance and preventive measures, aimed at educating communities and identifying and treating individual cases.

About **AIDS** we noted that in the early 1980s, a small number of homosexual men in the United States began to experience unusual infections, previously seen only in people with severe immune deficiencies. In the coming years, the human immunodeficiency virus (HIV) has been discovered and its global burden has been recognized. We **emphasize** that HIV / AIDS has **mobilized Western communities** to behave like never before (public health interventions and legislative changes). All the changes led to lower rates of new HIV cases, while global investment in research and public health led to the development of antiretroviral drugs that stopped replication of the virus, helped control HIV infection, and significantly reduced the risk of AIDS progression. On the other hand in 1999 researchers discovered that the HIV strain identified in monkeys is almost similar with the one in humans and from there and many other researches they developed different theories concerning the source of HIV, when and where the HIV starts in humans etc

Regarding **influenza**, the authors point out that the virus is generally responsible for respiratory disease of varying severity and generally does not require treatment. However, influenza has been responsible for more deaths in the last century than HIV / AIDS and Spanish influenza, Asian influenza, flu Hong Kong. The Spanish influenza pandemic of 1918 has led to the deaths of over 40 million people; more than double the number of deaths in World War I over the last four years. It has progressively spread throughout the world, through the modernization of transport and trade systems and the mass movement of military troops. And in more recent times, outbreaks of avian influenza and swine flu have occurred. There is a permanent threat of a repeated influenza pandemic due to the industrial-scale cultivation of birds and pigs that are susceptible to being infected and of people's proximity to these animals. **The World Health Organization has declared the outbreak of influenza A (H1N1) in June 2009 to be a pandemic**. Influenza can also affect other animals, such as pigs, horses and birds.

The scientific clarifications of many of the epidemics /epizootic/ pandemics are based on the lessons learned / previous e]periences, yet many of them are belonging to the contemporary era [10, 22]. **At the beginning**, epidemiologists used the written sources (antiquity, middle age, modern age) to compare, identify and track the ways and rates of transmission of the disease, the vulnerability and resistance of species to various pathogens. **In the contemporary age,** other sciences come to contribute to humanity's fight against major diffuse diseases: Biomathematics / Statistics and Probability Theory (such as the introduction of risk estimation -1620, the development of the first static model of a disease - 1700, the study of the temporal and spatial model of cases - 1855) is an instrument that helped / assist in discovering the underlying laws that describe the evolution of diseases / epidemics / pandemics, risk analysis that permit to characterize the nature and the likelihood of a disease to appear in a population, Molecular biology (founded in 1930), genetics (mainly 1900s), paleo pioneers (middle of XIXth century) - and archeopathology that have found new ways to highlight pathogens in human remains in the distant past. It is also worth mentioning that **the 21st Century** is the century of the informational era / digital era, and it is associated with massive changes in new technologies, new devices in the field of medical, social research etc.

An essential element of the contemporary age **is the organisation of the mankind at international level** seeking cooperation and integration **at all levels -** scientific, economic,

political and social, in order **to fight against the epidemics/epizooties/pandemics episode**.

In this context on 25 January 1924, the International Organization of Epizootics (OIE), now the World Organization for Animal Health (WAHO), is established. The purpose of the OIE is to control infectious animal diseases [16,17,18].

The OIE objectives / priorities are [15, 16, 17, 18]:

- ensuring transparency regarding the overall health situation of animals;
- collecting the analysis and dissemination of veterinary scientific information;
- encouraging international solidarity in disease control;
- protecting global trade by publishing health standards for international trade in animals and products of animal origin;
- improving the legal framework and the resources of national services;
- provide a better guarantee for animal food and promote animal welfare through a scientific veterinary approach;

On **16 October 1945**, the Standing Food and Agriculture Organization (**FAO**) was established. The Animal Health Service of the FAO addresses four animal health issues: cross-border diseases, vector diseases, veterinary public health (including food safety) and veterinary services. The latter must join forces and encourage more active participation of the private sector by defining complementary roles for each with specific responsibilities in order to improve and / or maintain the overall health status of a country.

On **April 7, 1948**, the World Health Organization (WHO) was established. Its goal is to reach the highest possible level of health by all people.

On **1 January 1995,** the World Trade Organization (WTO) was established.

The European Commission has formal observer status within OIE since 2004.

Co-operation and coordination between international organizations is a basic tool in the fight against epidemics / epizootics / **pandemics**. There are countless sectors where the OIE collaborates with the other international organizations (WHO, FAO, Codex Alimentarius, WTO, and, more recently, INTERPOL)

Since 2010, the OIE has engaged in a **Tripartite Alliance** with the WHO and the FAO, establishing responsibilities for these three organizations in combating diseases that have major health and economic consequences, particularly on zoonoses. Within the framework of the **Tripartite Alliance**, FAO, OIE and WHO recognise their respective responsibilities in fighting diseases, including zoonoses, that can have a serious health and economic impact. [2]. They have been working together for numerous years to prevent, detect, control and eliminate disease risks to humans originating directly or indirectly from animals. In 2010, the FAO/OIE/WHO Tripartite Concept Note (April 2010) officially recognised this close collaboration, with joint strategies at the human-animal-environment interface, to support their Member Countries. **Three priority areas of work were defined: zoonotic influenzas, rabies and the fight against antimicrobial resistance.** (*Article in Journal of Veterinary Epidemiology 19(2):96-99 · January 2015 with 10 DOI: 10.2743/jve.19.96*) [12].

Antimicrobial resistance is one of the three priority aspects of this **Tripartite Alliance**. Its activities involve the coordination of global strategies to combat short-, medium- and long-term antimicrobial resistance and support for their implementation at the national and regional level With antimicrobial resistance (AMR) on the rise in the EU, it is vital to ensure that lessons [8] learnt from successful strategies are made accessible to all Member States. To deal with the cross-border health threat of AMR, it is crucial to identify and share best practices and policies, so that a lack of action in one region or sector does not undermine progress made in others. To assist with and accelerate this collaboration, in early 2017 the Commission set up an AMR One Health network of government experts from the human health, animal health, and environmental sectors, as well as the **EU scientific agencies working in the human**

and animal health sectors (ECDC [5], EMA, and EFSA). Within the AMR One Health network, its members work towards facilitating mutual learning, sharing innovative ideas, building consensus, comparing progress made in key areas and, where necessary, accelerating national efforts to tackle AMR. The OIE recently made a strong contribution to the WHO's Global Action Plan on Antimicrobial Resistance, adopted in 2015, which seeks to ensure, for as long as possible, the treatment of infectious diseases with effective, quality antimicrobial agents. By proposing key actions to be implemented in the next five to ten years, the Plan emphasises the importance of the OIE's intergovernmental standards and supports the implementation by the OIE of a global database on the use of antimicrobial agents in animals.

In 2011, the European Commission and the OIE concluded a Memorandum of Understanding on their general relations (2011 / C 241/1).

By going through these historical stages, it can be said that pandemics that evolved for thousands of years become clearer in the last 20-30 years than in the past centuries. For 2500 years, historians and representatives of famous schools have tried to identify the disease that produced **a** plague in Athens by comparing the symptoms described by Thucydides with that of contemporary diseases. Therefore there have been numerous theories concerning plague and Ebola, typhoid fever, smallpox, measles, cholera, influenza, ergot poisoning, and a host of other diseases transmitted by animals. The scientific community at that time did not accept any of them. In addition, the description given by Thucydides was questioned because some of the features of the disease were questioned. But only in the last 60 years studies and research conducted epidemiological approach and mathematical models, risk analysis [7,14] and other modern approaches have demonstrated that diseases can be monitored through a common strategy and management and precautionary methods. Studies conducted by Manolis J. Papagrigorakis et. Al. (1995), on the "examination of ancient dental pulp DNA" allowed analysis much more accurate of what happened in 430 BC.

The epidemiological approach and the mathematical models compared Athens's plague with other ancient epidemics described earlier in the article, **still the** epidemic from Athens in 430 BC, **remain a mystery**.

Epidemiology as a stand-alone discipline emerged only after the Second World War [2].

Current epidemiology, in its many forms, is the science on which the rules of prophylaxis, control, and eradication of infectious diseases have been built. However, science does not always have answers to all questions and often seems to be overcome by not knowing etiological agents or the evolution of these agents. For example, the herpes virus that infects humans evolves over time, adapting so that they continue to retain the ability to infect human cells (the question arises as to who first appeared the virus or cell?). Resistance to antimicrobial agents that due to excessive use and abusive use of antibiotics is another priority for the consideration of human kind.

From the bibliographic study on the history of some epidemic diseases in Romania, there is little evidence of plague in the XIII th century in our country. They begin to abound only from the 16th century. From that moment on, it's about every decade. In 1576, 7,000 people died in Brasov, in 1585, the famine associated with plague broke out in Moldova, and a new devastating epidemic emerged in three years. In 1684, the first measures to prevent and combat (the closure of the borders, the inhabitants are urged to leave the towns, the aliens are carefully guarded) ("The Plague in the Epidemiology of the Romanian Past" written by Pompey Gh. Samarian) Grigore Ghica orders to build a hospital for the plagues at Pantelimon, and set up the guild of the dudes (who oversaw and buried the plague). Romanians use "healing" remedies for healing: cataplasms made of flour with honey applied on swellings, vinegar **and** charcoal. In purulent cases they used painful methods: "When pustules appeared, they were cut with scissors and after the dirt

disappeared, superficial sacrifices were practiced, and then they were dancing small ulcers with ointment, until the perfect change for good, after which the healer was used "(Pompey Gh. Samarian). The worst epidemic of plague occurs in 1812-1813 in Muntenia (about 40,000 deads), the most affected being Bucharest. By 1830, the last cases of plague were recorded in the Romanian lands, and to 1850 the molars disappeared from the Balkans. Between the two world wars, there was ~~a~~ morbidity and mortality raised by exanthematic typhus. Thus, in the winter of 1917 and the spring of 1918, there were over 750,000 sickness cases in Moldova followed by 125,000 deaths. At the end of the Second World War, only in Moldova, they mentioned over 80,000 cases, with about 3,500 deaths.
The literature cites that Romania has been and is surrounded by diseases that are subject of today's international debates. Even applying preventive measures, we still deal with some of these: contagious nodular dermatosis, avian influenza, African swine fever etc . The recent experiences showed that the diseases are very expensive, costs attributed to control the diseases, costs derived from the trade losses costs, increased labour costs etc and therefore they have a major economic and social impact."

Fig. 3. Pig death due to African swine fever in Romania
Source: 2018, TV1 Satu Mare.

The EU animal health law [6] aims to prevent and to control animal diseases that are transmissible from animals to humans and from humans to animals. It provides rules for preventive measures, for active and passive surveillance, for early detection of diseases human-to-human or animal-to-human diseases and seeks to strengthen the level of vigilance and training of competent authorities against the risks posed by diseases. Furthermore make available rules for prioritization and classification of diseases, establishment of responsibilities, notification and reporting of the diseases systems, surveillance and eradication programs and disease-free status, raising awareness of disease, disease preparation and control, emergency measures to be taken in the event of an emergency caused by a disease.
The EU legislation particularly aim**s** to reduce the negative effects on animal health, public health, and the environment and take into account the link between animal health and public health, the environment, including biodiversity, and precious genetic resources as well as the effect of climate change, antimicrobial resistance, food safety, and so on.

CONCLUSIONS

Given the fact that the assessment is in the first stage (collection data, reviewing it) the methods that we are looking for are not defined yet. No interpretation is ready yet at this stage of the article.
But during this reviewing exercise, we learned that:
-humankind learned and can still learn much from the past,
-different other sciences are helping us today to read the past (archaeology, genetic) to predict [2] the future (modelling) [3,5,14,19], to communicate, calculate faster, mapping the risks and distribution of epidemics (information technology) etc
-humankind defeated some fights along centuries with microbes but continue to fights against others,
-microbes looks that they are adapting in hostile environments
-evolution brings new gaps in knowledge,
-little scientific evidence is available in order to support mechanism involved in emerg**ing** diseases,
-continued and increased political and financial support is essential to ensure

coordinated diagnosis and management strategies, supervision and care and universal access to new knowledge

-an essential characteristic of the contemporary age is the organization and management of humanity at **the** international level / 1924 represent the moment when mankind has started to organi**z**e themselves at international level against microorganisms (OIE)

-humankind managed to eradicate Smallpox in 1980

-in case of HIV- Western communities mobilized to behave like never before (public health interventions and legislative changes).

But, in other cases, the microorganisms evolving therefore they overcome mankind's emergency preparedness (ie antimicrobial resistance).

REFERENCES

[1]Animal Health in Australia, 2014, Canberra, Australia, www.animalhealthaustralia.com.au, Accessed on 12.2018

[2]Cardoen, S., De Clercq, K., Vanholme, L., De Winter, P., Thiry, E., Van Huffel, X., 2017, Preparedness activities and research needs in addressing emerging infectious animal and zoonotic diseases, Rev. Sci. Tech. Off. Int. Epiz., 36 (2), 557-568.

[3]CDC, 2017, One health Zoonotic Disease Prioritisation for Multisectoral Engagement in Tanzania,

[4]Domingo, R.D., Lopez, E.L., Cabantac, L.Z., Vytiaco, .A.A.V., De Mayo, A.D., Bucad, A.C., 2016, Current status of important trans boundary animal diseases in the Philippines, Food and Fertilizer Technology Centre, www.fftc.agnet.org, January 2019,

[5]EFSA Scientific Opinion, 2009, Control and eradication of Classic Swine Fever in wild boar, EFSA Journal, 932 1-18 https://www.efsa.europa.eu/en/efsajournal/pub/932 Accessed on February 2019

[6]European Commission, Animal Health Law, https://ec.europa.eu, March 2019.

[7]European Centre for Diseases and Control, Towards One Health Preparedness, 2018, ecdc.europa.eu, November 2018,

[8]FAO, 2009, Risk analysis and Contingency planning, www.fao.org, Accessed on 02.2019,

[9**]**From panic and neglect to investing in health security: financing pandemic preparedness at a national levelhttp://documents.worldbank.org/curated/en/979591495652724770/pdf/115271-revised-final-iwg-report-3-5-18.pdf,

[10]Harvard Global Institute, 2018, Global Monitoring of Disease Outbreak Preparedness, globalhealth.harvard.edu, Accessed on February 2019

[11] Iftimovici, R., 2015, Universal history of Medicine and Pharmacy, 2nd Ed, revised and completed, Vol. I. From the beginning up to the 29th century, The Romanian Academy Publishing House (Istoria Universală a Medicinei si Farmaciei, Ed a-2-a revăzută şi adăugită, Vol I. De la începuturi până în secolul XX, Ed.Academiei Romane), pp.7-160,

[12]Kugita, H., 2015, Activities on Antimicrobial Resistance under the Tripartite Alliance among FAO, OIE and WHO, Journal of Veterinary Epidemiology 19(2):96-99.

[13]Ministry of Disaster Management and Refugee Affairs, Republic of Rwanda, 2016, National Contingency Plan For Animal And Plant Diseases, midimar.gov.rw, Accessed, on November 2018,

[14] Munyua, P., Bitek, A., Osoro, E., Pieracci, E.G., Muema, J., Mwatondo, A., Kungu, M., Nanyingi, M., Gharpure, R., Njenga, K., Thumbi, S.M., 2016, Prioritization of Zoonotic Diseases in Kenya 2015,PLoS One, 11(8), 24 Aug.2016, www.ncbi.nlm.nih.gov, Accessed on 12.2018

[15]NATO,Veterinary guidelines on major transmissible animal diseases and preventing their transfer, a Med P -26, kam.lt/download/17571, March 2019,

[16]OIE, 2014, Guidelines for Animal Disease Control, www.oie.int, November 2018,

[17]OIE, 2009, Prevention and Control of Animal Diseases, Oslo, Norway, 18-19 June 2009, www.regjeringen.no, January 2019,

[18]OIE, 2013, Japan's comments on The Code Commission report of the September 2013 meeting, www.maff.go.jp, December 2018,

[19]Office of Science and Innovation, 2006, Infectious Diseases: preparing for the future, London, assets.publishing.service.gov.uk, Accessed on January 2019,

[20]Scottish Government, 2017, Exotic animal disease contingency framework plan, Covering exotic notifiable animal diseases of livestock, 5th edition, 2017,www.gov.scot, Accessed on 11.2018,

[21]Thrusfield, M., 2007, Veterinary Epidemiology, Third Edition, Wiley Blackwell, pp. 1-16,

[22]UNCHR, 2011, Epidemic Preparedness and Response in Refugee Camp Settings**,** https://cms.emergency.unhcr.org/documents/11982/54561/UNHCR%2C+Epidemic+Preparedness+and+Response+in+Refugee+Camp+Settings%2C+2011+--/066ef592-d1bb-4059-a6dd-41900e4c8ade (Accesed on 02.2019),

[23]Wikipedia, Globalization and disease, Plague, tuberculosis, smallpox, typhus, influenza, syphilis, https://en.wikipedia.org/wiki/Globalization_and_disease, (Accessed on 03.2019)

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE MAIN PHISIOLOGICAL PROCESSES THAT PARTICIPATE AT THE FORMATION OF THE VEGETAL MASS FOR THE OLT CORN HYBRID

Liviu OLARU

University of Craiova, Faculty of Agriculture, 13 Alexandru Ioan Cuza Street, Craiova, Code 200585, Romania, Phone: +40 251 414398, Fax: +40 251 411688, Email: liviu.olaru.dtas@gmail.com

Corresponding author: liviu.olaru.dtas@gmail.com

Abstract

This paper presents originality by the fact that helps us understand better and special supports the farmers to understand the importance of knowing the main physiological, biochemical and chemical elements which determine the formation of vegetable mass for the corn. In this paper it was studied the Olt corn hybrid which is cultivated on large areas of land especially in the SW area of Oltenia, more precisely on the territory of the Caracal Plain. It is important to remember that on the forming and the welfare of the corn mass depends on the future production. Both the humus reserve in the soil and also the unequal administration of some doses of nitrogen and phosphor determines increased production. It has been watched the vegetation's state of this hybrid in correlation with the chemical changes of the plants through the use of chemical fertilizers that are correlated also by the cultivation system that had been used so named irrigated and non-irrigated system.

Key words**:** *physiological processes, humus, hybrid, chemical composition*

INTRODUCTION

Due to the unrealistic exploitation of soils, today we are dealing with arid areas knowing that the destruction of the first fertile layer of the soil where 3 cm of soil are going to recover between 300-1,000 years, 20 cm are going to recover between 3-7 thousands of years [2]. It is known that chemical pollution of the soil with fertilizers, especially the ones with nitrogen, which if are being not used rationally, in too large doses has already caused severe phenomena of pollution of the soil and water with nitrates and seriously affects the health of humans and animals from these areas [2].

The corn being not a too pretentious plant for our environment conditions and that occupies the second place after wheat culture, finds more and more the interest of the scientists to find methods and studies for obtaining lines or hybrids more productive and more resistant. As for the formation of the harvest is needed to carry out the normal process of photosynthesis, and capability of warehousing, which are heavily influenced by the plant density. By increasing the number of the plants per square meter is being obtained a significant increase in both foliar surfaces, obtained by all the plants of the unit area (square meter), rendered by the foliar surface index, and the total number of grains that we obtain by a greater number of cobs/square meter. The direct relationship between the two productivityelements with the sowing density has as a limit the reduced production done by the plant [13].

The combined influence between the variety and the cultivation technology determines the main changes of the physiological characteristics that may influence the acquisition of larger productions by the differential administration of the fertilizer doses [8].

Watering system comes to supportthe normal development of maize of water where the optimum water consummation and the needed water for irrigation depend first on the climate and less on the soil [1].

Pursuing the changes aspects brought by the excess of the water in the soil, as well as knowing the interactions soil-plant - the

atmosphere is very important in optimizing the agricultural production [5].

Research regarding the water consumption of the irrigated crop (the maximum real evapotranspiration, was the subject of various publications in the country and abroad [3, 4, 10, 7].

The nitrogen and phosphorus fertilizers administered differentially to some hybrids of corn determines the major changes in physiological processes that take place for the corn in various stages of vegetative growth [9].

MATERIALS AND METHODS

The device with experiences has been set at the plant farm SC Record SRL, from Caracal, Olt County, Romania, having as reference years: 2016, characterized by a hydric deficit and 2017, a year favorable for the cultivation of corn, and the size of the plots were 20 m/20 m.

For a better presentation with the concrete results obtained by physiological processes studied, were taken sampling of soil from the plots established at a depth between 0-25 cm before installing in thaw field the device with field experiences. Thus, the experience beingpolifactorial were studied three factors:

Factor A: Olt corn hybrid

Factor B: The application of differential doses of Nitrogen and Phosphorus with four graduations, as follows: N_0 P_0, $N_{60}P_{80}$, $N_{80}P_{100}$, $N_{100}P_{120}$, and $N_{120}P_{140}$.

Factor C: irrigation system with two graduations: (i) Watering system and (ii) Non-watering system.

From the physiological processes studied we remind: the respiration, the coefficient of transpiration, the intensity of smooth assimilation, the photosynthesis, sucking force, absorption capacity, the total of the chlorophylls, total content of nitrogen and phosphorus followed by ISF (the index of foliar surface).

For the correct use of the doses of nitrogen fertilizer in tight connection with the active growth factor action has been applied the following formula:

$$DOE_N = \frac{10g\left(2.3 \cdot C \cdot A \cdot \frac{VUP}{CUI}\right) - CP_s}{C}$$

Source: [6]

where:

(C) = the coefficient of nutritional element in the soil or the chemical fertilizer calculated by authors;

A = expected maximum harvest;

VUP - the value per unit of the product;

CUI = the cost per kg of the fertilizers a.s.o.

CP_s = calculated nutrient input from the soil reserve after the agrochemical mapping values evaluated after.

Determination of soil analyses were done by the following methods:

The soil pH by potentiometric methods; Ah with the solution of a state that hydrolyses in an alkaline way; Sb by Kappen method; Phosphorus by the Engner method-Rriehm-Domingo; the humus by Walklei and Black method; The nitrogen is determined by colorimetry using the photocolorimeter [11].

Plant analysis determinations concreted through:

Total Nitrogen by the Kjeldahl method; Total phosphorus by fotoclorimetric method; Photosynthesis by Baradulina method; The net yield of assimilation method (N.A.R.); The intensity of respiration by Boysen-Jensen method; The intensity of the transpiration through L.A. Ivanay method; ISF Lan method through weighting and reported to the respective surface m^2/m^2 ground-absorptive capacity by the gravimetric method [12].

RESULTS AND DISCUSSIONS

In 2016, before replacing the experimental device were collected soil samples from four different places from the field and we got the following results which are presented below:

After the results from the soil samples collected, led to the conclusion that they are characteristic of the experienced soil, so we can say that the pH reaction is neutral, with the exception of 3 way that slights towards alkalinity, total capacity of cation exchange

(T) has medium values between 28.36-29.15, degree of saturation in (V) is less than the variants 1, 2, and 4, but grows to 3 to 85.81., and the data are expressed in mill equivalents and has values between 23.11-23.17.

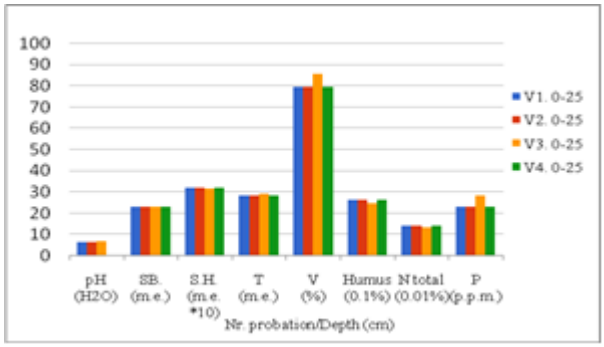


Fig. 1. Determination of the main features of the chemical properties of the soil from argiloiluvial type in 2016 from the experimental device
Source: Author's results.

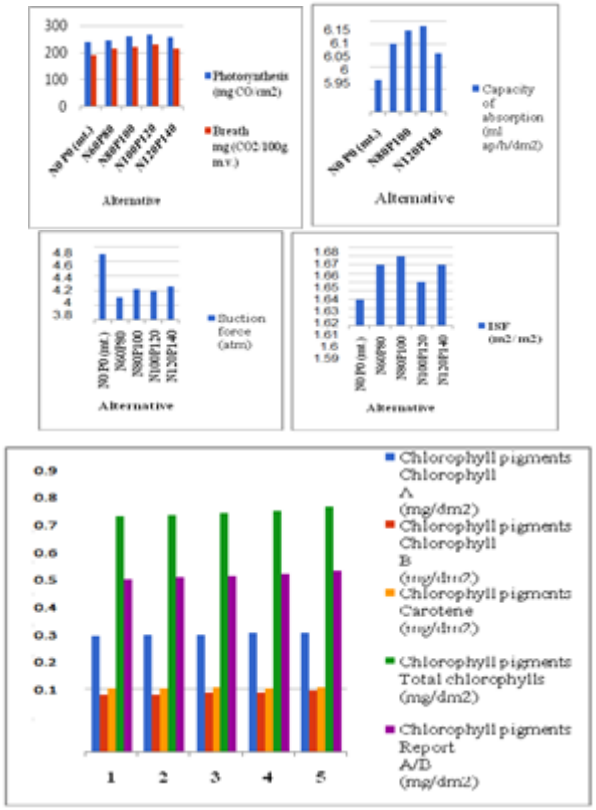


Fig. 2.The physiological processes that take place on forming the four leaves under the influence of the fertilizer doses and the planting un irrigated system. Year 2016
Source: Author's results.

Because the content of humus, Nitrogen and Potassium is low, these results have a negative effect on the natural fertility of the soil, which is why we will intervene with the doses determined by Nitrogen and Phosphorus for each repetition.

Because the Olt hybrid is a semitardive hybrid with a vegetative growth period of about 138 days, by combining the fertilizers doses with irrigated and non-irrigated system, we have determined some physiological processes taking place especially in the complete training of four leaves.

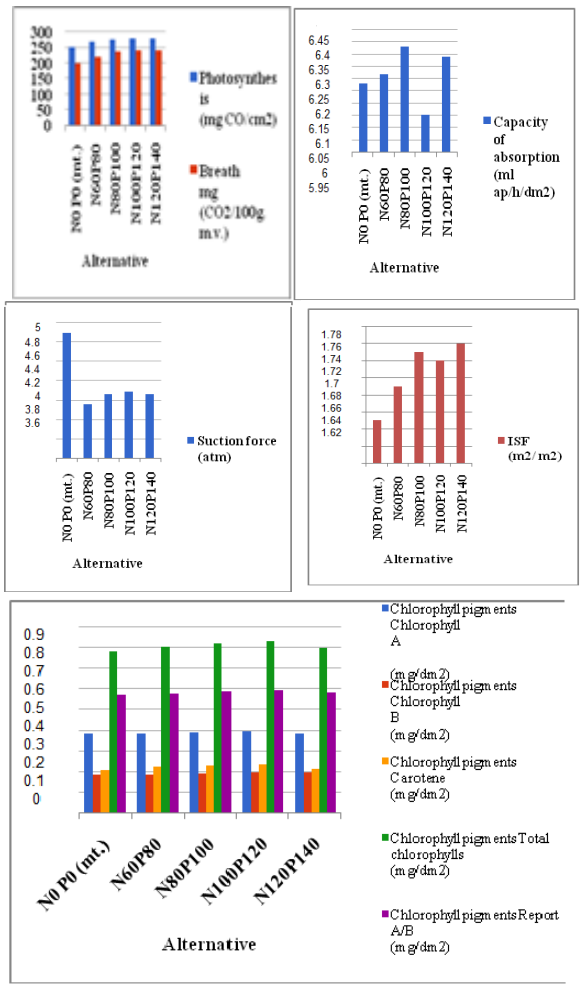


Fig. 3. The physiological process that takes place on forming the four leaves under the influence of the fertilizers doses and the irrigated system. The year 2016. Source: Author's results.

From Fig. 2 and 3 it can be seen that the values of the photosynthesis process are higher than the version control and presents an increase of 18% in relation to irrigation system at non-irrigated, but for N_{120} P_{140} in the two systems it feels a slight lowering of the intensity of the photosynthesis, and that at this dose, the corn doesn't react so good.

In the process of breathing, there aren't big differences in relation to the both systems, and results that the amount of carbon dioxide eliminated isn't significant in the cases of variants that we studied.

Absorption capacity has insignificant values in relation to the witness in non-irrigated system 6.02-6.14, but together with the administration of the fertilizers and the irrigation system the values are significant.

Suction pressure force presents an increase in the non-irrigated system from the first three options in relation to the control group, followed by a decrease in the values. In the irrigated system values are significant in three variants, and the variant $N_{120}P_{140}$ presents a slight decrease. Chlorophylls pigments are superior comparing the w irrigated with the un irrigated system. The ratio of chlorophyll A/B, is superior to the chlorophyll A in chlorophyll B detriment on the both systems. The foliar surface index limits is closely related to a Variant to another with good results in the two systems from the application doses $N_{80}P_{100}$.

The net rate of assimilation presents increasing values on the application of chemical fertilizer doses for both systems considered in the study.

Because I took into account the two years of study I will make the same determinations of soil and plant, except that this year is richer in precipitation.

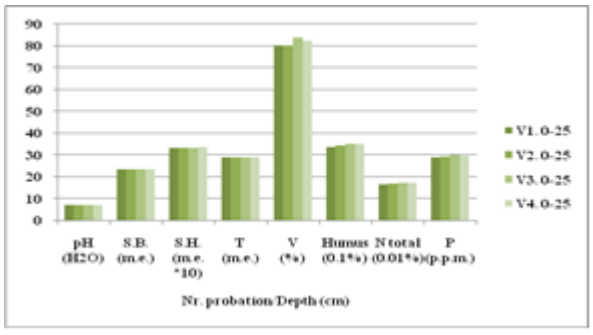


Fig. 4. The determination of the main features of the chemical properties of the argiloiluvial soil type in 2017 from the experimental device
Source: Author's results.

Due to the precipitation which fell and who helped all the chemical properties of the studied soil characteristics to become positive and to characterize argiloiluvial soil as favorable for the growth and development of corn and hence leading to the desired production.

There were again taken samples of plants to study the same physiological processes as in the previous year. The results are shown below.

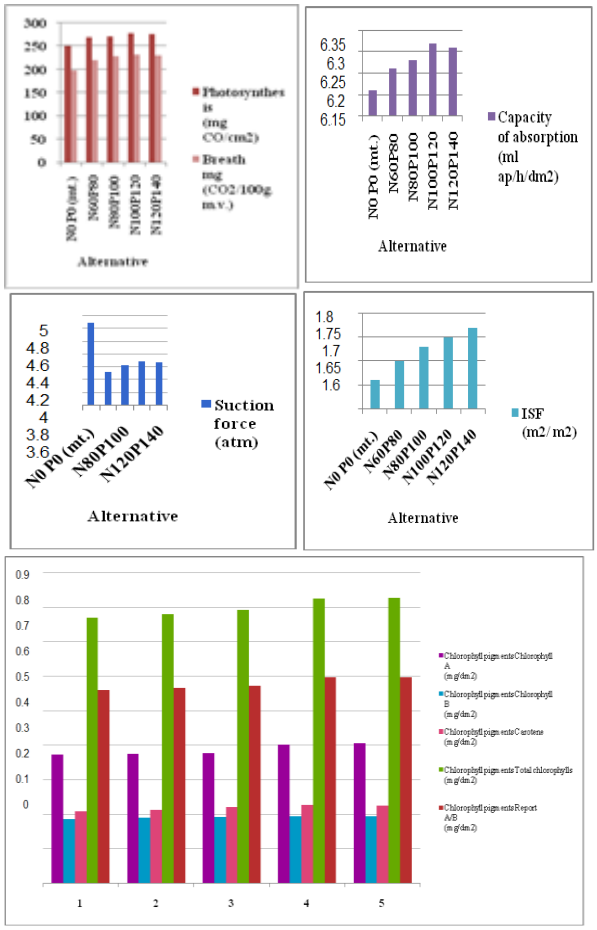


Fig. 5. The physiological processes taking place in the formation of the four leaves under influence of the fertilizers doses and non-irrigated crop system. The year 2017 Source: Author 's results.

The application of differentiated doses of nitrogen and phosphorus causes changes and increases all physiological processes taken into study with the difference in relation to witness that recorded all the lowest results.

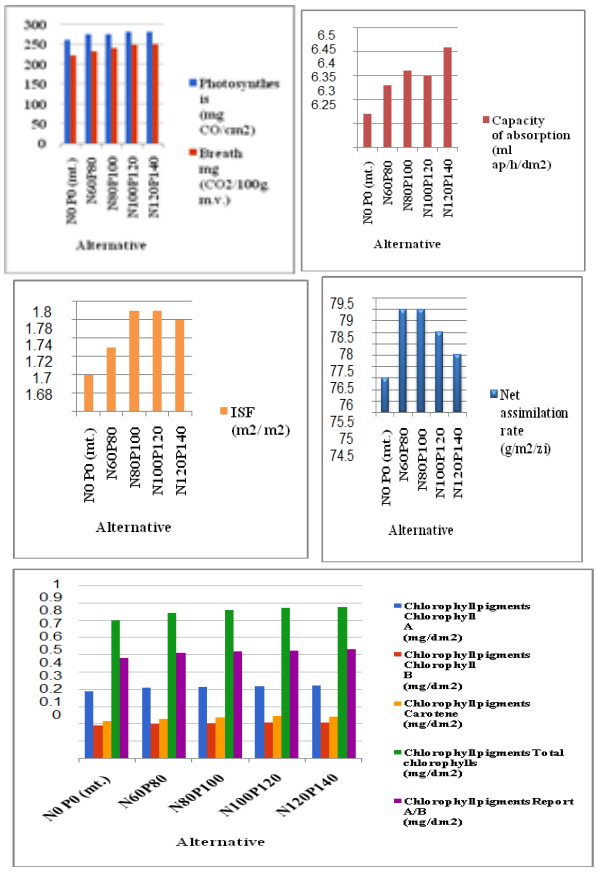


Fig. 6. Physiological processes taking place in the formation of the four leaves under influence of fertilizer dose and irrigation system. The year 2017.
Source: Author's results.

So the intensity of the photosynthesis has higher values in the relation to witness on the irrigated system at 261.7 at 282.2 mg CO/cm^2, and in the non-irrigated system the values are between 250.1 to witness and 277.2 mg CO/cm^2 to the application of the dose of $N_{100}P_{120}$.

The capacity of breathing presents a higher value in irrigated system in relation to the witness 221.5 CO^2/100g green mass but higher on dose application $N_{120}P_{140}$, in return the best results obtained in non-irrigated system are those to which has been applied a dose of fertilizer $N_{100}P_{120}$.

The absorption capacity presents an uptrend in both systems but with better results in watering system in the application of the dose of $N_{120}P_{140}$ ml value 6.46. ap/h/dm^2 in relation to witness 6.32 ml. ap/h/dm^2. The suction force, expressed in atmospheres, is growing steadily in both systems, and there's no significant difference, however, with slight differences between the two systems.

The chlorophylls are highlighted specially by the significant values of the chlorophyll, but chlorophylls B show no spectacular increase except where the application of irrigation system of $N_{120}P_{140}$ in irrigated system value recorded is 0.212 mg/dm^2.

The total of the pigments presents significant percentage differences between witnesses and the experimental variants, significantly increasing in both culture systems with increasing the doses of the fertilizer.

The index of the foliar surface presents increasing values in relation to the witness to non-irrigated system variant from 1.66 m^2/m^2 at 1.77 m^2/m^2 the variant in which the applied dose of $N_{120}P_{140}$ otherwise the best result in the irrigation system meets the N variant $_{100}P_{120}$ and $N_{80}P_{100}$ where is the value of 1.79 m^2/m^2.

CONCLUSIONS

From the determinations of the Olt corn hybrid, it has appeared that the application of the doses of chemical fertilizer result the major changes of the physiological processes that take place in the period of vegetative growth of the corn.

Application of fertilizers together with the irrigation system enhances the metabolism of existing nutrients in plants.

The a analysis of the physiological processes studied, lead to the conclusions that the highest potential value was recorded in the irrigation system, in particular the application of fertilizer doses $N_{100}P_{120}$ followed by the version with doses of $N_{120}P_{140}$.

We can conclude that the studied Olt corn hybrid performs very well on the soils of the Caracal.

It is recommended to be taken in the culture at the doses of $N_{100}P_{120}$ and $N_{120}P_{140}$.

Aplicarea îngrășămintelor împreună cu sistemul de irigații intensifică metabolismul nutrienților existenți în plante.

REFERENCES

[1]Allen, R. G., Pereira, L., S., Raes, D., Smith, M., 1998, Crop evapotranspiration, Guidelines for computing crop water requirements, FAO Irrigation and Drainage Paper 56, Rome, pp.301.

[2]Ghidira, V., 2004, Ecotoxicology and monitoring of major pollutants, Ed. Studia, Cluj-Napoca, pp.24-29.
[3]Grumeza, N., Alexandrescu, I., Mihalache, L., 1970, Researches on the regime of irrigation in vineyards in the South-East of the country. ICIFP Annals, Series Land Improvements, Vol. III (VII), Bucharest: 59-71.
[4]Grumeza, N., Kleps, C., Dumitrache, E., 2004, Interrelations between the environment and crop plants related to the use of irrigation in different climatic and soil conditions in Romania "Romanian Farmer, no.3, Bucharest, pp. 5.
[5] Hera, C., Borlan, Z., 1980, Influence of fertilization with nitrogen and phosphorus and the amount of precipitation on the production and accumulation of nitrogen in corn, "ICCPT Fundulea, Vol. XLV, Bucharest, pp.183.
[6]Hera, C., Borlan, Z., 1980, Guide to compiling fertilization plans, Ed. Ceres, Bucharest, pp.96.
[7]Pandia, O., Saracin, I., Stoian, F., Gheorghe, M., Gheorghe, F., 2009, Influence of the nitrogen and phosphorus doses on some physiological processes of the crop hybrid Orizont year – 2007, "Scientific papers (INMATEH), Vol. 28(2):67-73.
[8]Pandia, O., 2006, Research Regarding the Effect of Fertilizers upon Maize Production and Quality, Ph.D. Thesis, University of Agronomic Sciences and Veterinary Medicine of Banat, Timisoara.
[9]Păltineanu, Cr., Mihăilescu, I.F., Seceleanu, I., 2000, Dobrogea, pedoclimatic conditions, consumption and irrigation water requirements of the main agricultural crops, EX PONTO Publishing House, Constanta, 258 pp.
[10]Pereira, .S., Perrier, A., 1996, Evapotranspiration and irrigation Scheduling, ASAE, pp.109-115.
[11]Research Institute for Soil Science and Agro-chemistry (ICPA), 1976, Soil Agrochemical Analysis Methodology, ASAS, Bucharest.
[12]Research Institute for Soil Science and Agro-chemistry (ICPA), 1980, Plant Analysis Methodology for Assessment of Mineral Nutrition Status, ASAS, Bucharest.
[13]Vătămanu, V., 2015, Density of corn plants, an important technological element, AgriMedia Magazine, No.5, pp. 12.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

STUDIES AND RESEARCH ON THE QUALITATIVE CHARACTERISTICS OF THE OLT CORN HYBRID

Liviu OLARU

University of Craiova, Faculty of Agriculture, 13 Alexandru Ioan Cuza Street, Craiova, Code 200585, Romania, Phone:+40251414398, Fax:+40251411688, Email: liviu.olaru.dtas@gmail.com

Corresponding author: liviu.olaru.dtas@gmail.com

Abstract

In this paper it was achieved a study on the continuity of the Olt corn hybrid cultivated in the Caracal Plane, Olt County, hybrid that is extensively grown in this area being adapted to the conditions of that thermal - hydro stress but also with very good results regarding the production sown in irrigation system combined with the unequal administration of nitrogen and phosphorus doses. For this reason, there were performed biometric measurements in two years as a reference, in two systems for irrigated and non-irrigated crop but also with different administration dose of chemical-based fertilizers of Nitrogen and Phosphorus. These biometric measurements have been made in the support of the production of corn grain in the two systems.

Key words**:** *biometrics, thermal - hydro, hybrid, production*

INTRODUCTION

Due to its biological particularities, and especially due to the introduction in the crop of hybrids, the corn has a great production capacity (6,000-9,000 kg grains/ha in the unirrigated system and 9,000-16,000 kg grains/ha in the irrigated way [8].

The period in which the corn consumes large amounts of nutrients overlaps with the period during which consumes large amounts of water and [4].

The estimation of the genetic progress for some morphs-physiological traits over the studied genotypes: the gap on blooming or ASI (An thesis slicking interval), the total Height of the plant and the height of the insertion of the main cob the number of leaves above the main cob leads to find the best corn hybrids that adapt to the new geographical conditions [2].

From the diseases ofthe corn, Fusarium root produces quantitative and qualitative damages. The accumulation of a miceliene mass of fungus like Fusarium on the grains and cobs increases amounts of mycotoxins extremely dangerous for human and animal health [5, 4, 9].

Through the application of different doses of nitrogen and phosphorus based fertilizers in some hybrids that have been indulged to be taken in the crop area for SW Oltenia, and through studies and researches that had been made [6, 7], recounts the importance of the morphological knowledge related aspects of corn plants which by some appropriate stimulation can lead to obtaining the desired crop.

In the year 1991 Novel GV., *et al.*, made a comparative study on the evaluating methods for the thermal requirements of the corn and in his book Axinte M, since 2006, indicated the importance of the knowing of the traits of the corn crop determined [1].

MATERIALS AND METHODS

Studies and researches have been realized two years as reference 2016 and 2017 at agricultural society SC RECORD from Caracal, Olt County, where a device has been established for the study and the research of this hybrid regarding the behavior and adaptability for this area, but also physiological changes occurred due to the application of the technology of irrigation system and interleaved with non-irrigated

under different doses of nitrogen and phosphorus.

That way we will determine qualitative and quantitative the characteristics of the corn plants through biometric measurements that contribute to the increased production, where plant density is 50,000/pl/ha, where plots have been of 20/20 m, and the soil is being an argiloiluvial chernozem [3].

Three factors have been determined:

Factor A: The Olt corn hybrid

Factor B: Irrigated system with two graduations: (i)Irrigated system and (ii) Non-irrigated system.

Factor C: The differential application of the Nitrogen and Phosphorus doses with four graduations, as follows: N_0 P_0, N_{60} P_{80}, N_{80} P_{100}, N_{100} P_{120} and N_{120} P_{140}

Thus, we studied morphological descriptors and granted notes on the basis of the results of the two irrigated and non-irrigated systems [10].

Measurements were made for:

-The number of plants from the studied plot;
-Plant height;
-Blooming date;
-Date of the trimming;
-Uniformity of the trimming;
-Bloomed plants;
-The height of the insertion of the cob;
-The total number of leaves;
-Panniculitis length;
-Length of cob;
-The number of drought-resistant plants;
-Physiological maturation period;
-Number of plants that dried prematurely;
-Note the plant at maturity;
-The number of fallen plants;
-The number of broken plants.

RESULTS AND DISCUSSIONS

As a result of the biometric determinations of the Olt corn hybrid, during the two years of experimentation, there were obtained the results shown in the figures presented below.

In Fig.1, there are shown the physiological properties and biometric measurements of the Olt corn hybrid in non-irrigated and irrigated system in the year 2016.

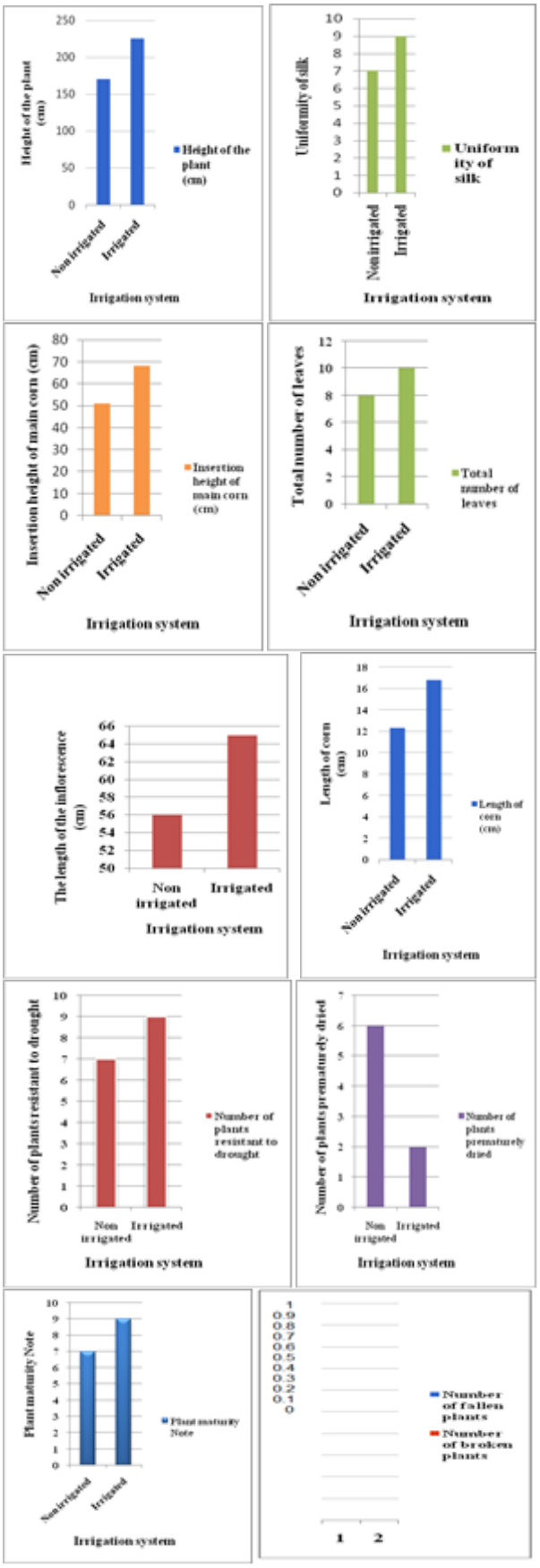


Fig. 1. Physiological properties and biometric measurements in Olt corn hybrid in non-irrigated and irrigated system. Year 2016

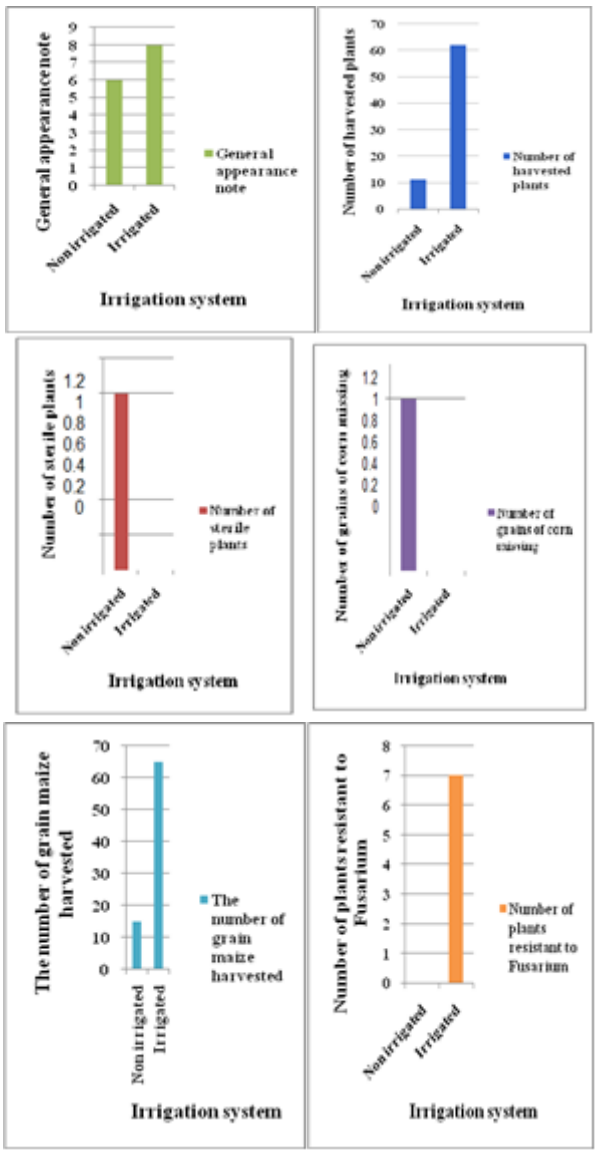
Source: author'd results.

Plant height in non-irrigated system records an average of 170 cm much smaller compared with the irrigated system where corn plants have an average height of 225 cm.

Blooming date for non-irrigated system has a delay of six calendar days compared with the irrigated system. 15.07.2016/09.07.2016.

The same difference can be noticed to the date trimming, the irrigated system influencing with a few days the precocity of the variety. The height of the insertion of the cobs is 51 cm, respectively 68 cm.

The total number of leaves is 8 to 10 leaves and plant drought resistant received note 7 at non-irrigated system and at irrigation system 9. Also the length of the panicle presents an average value of 56 cm 65 cm respectively being lower in non-irrigated system (Fig.2.)



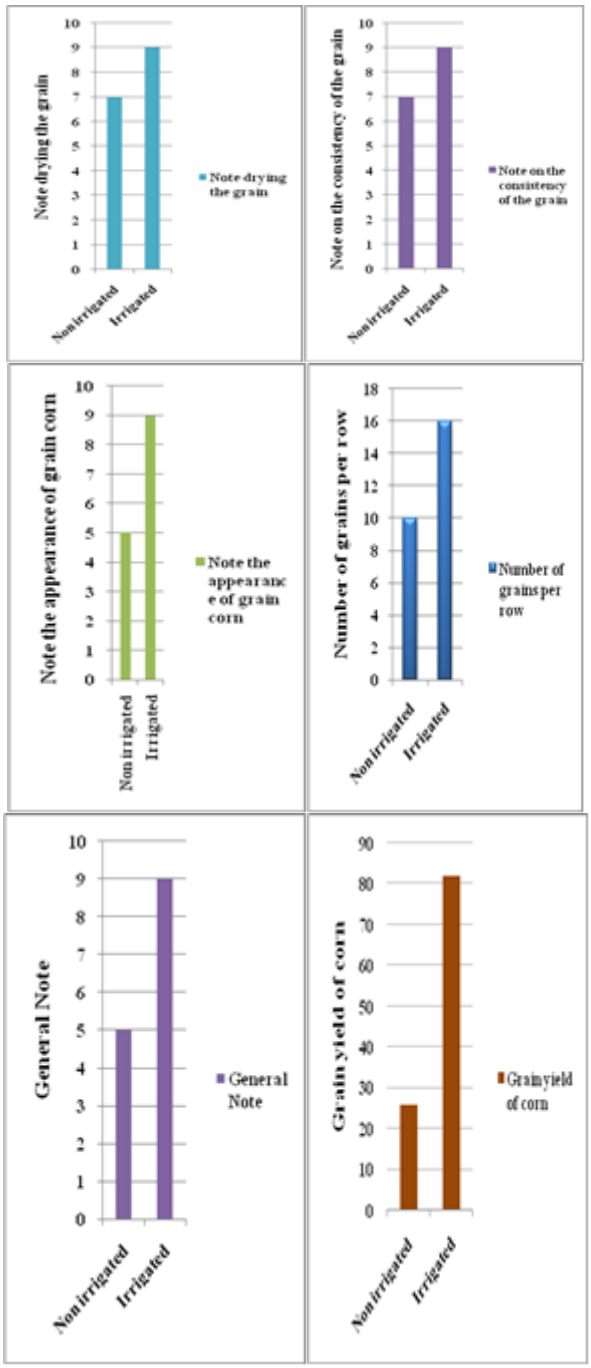


Fig. 2. The physiological characteristics of corn plants and the marks given for the two systems. Year 2016
Source: author's results.

The length of the cob has an appreciable size 12.3 in non-irrigated system and 16 cm, 8 cm in irrigated system. The number of plants dried out prematurely in non-irrigated system is 6, and in the irrigating system is of two plants.

Regarding the general appearance note in non-irrigated system was evaluated at note 5, and watering system 9.

By the number of plants which have been harvested, are 11 plants, for the non-irrigated system and the irrigation system at 62, with a number of cobs of respectively 15.65.
Yield in grains was 26% and 85% respectively, and their humidity, respectively 22.4 % and 24.2%. Data and notes are included in Fig. 1 and Fig. 2.
Also by biometric measurements and ratings had been analyzed the year 2017 too.
The year 2017 has been characterized as a year with higher humidity and which related to the application of chemical fertilizers in variable doses that also led to more vigorous plants resistant to drought and to fall with large cobs and the possibility of harvesting at adequate moisture.
Plant height in non-irrigated system recorded an average of 182 cm much smaller compared to the irrigated system where the corn plants have an average height of 235 cm.
Blooming date for non-irrigated system is 13.07.2017 comparing to the 07.07.2017 irrigation system.

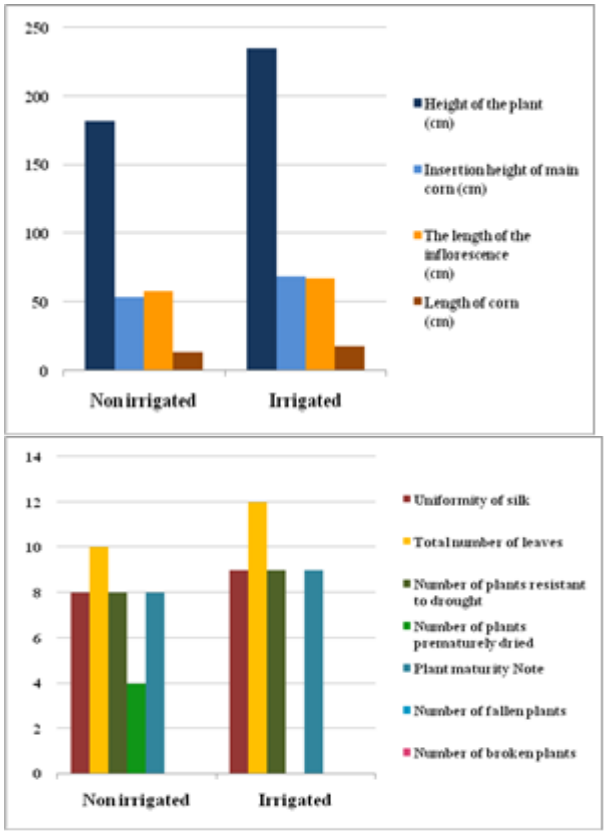


Fig.3.Physiological properties and biometric measurements in Olt corn hybrid in non-irrigated and irrigated system. Year 2016
Source: author's results.

The same difference is apparent and to date trimming, the irrigated system is influencing with few days the precocity. The height of the insertion of the cobs is 54 cm, respectively 69 cm. total numbers of leaves is 8 and 9 leaves and plant drought resistant number received note 8 and note 9 in non-irrigated system in irrigation system.
Also the length of an average value presents panicles of 67 cm 58 cm respectively, being lower in non-irrigated system.
The length of the comb has appreciable sizes 13.8 cm at non-irrigated system and 18.2 cm at irrigated system. The number of plants dried out prematurely in non-irrigated system is 4, and in the irrigated system is 0.

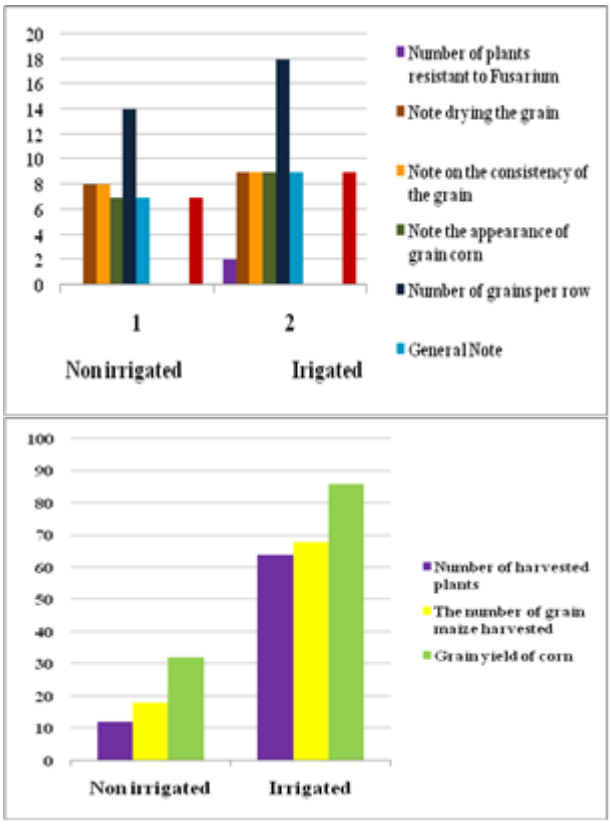


Fig. 4. The physiological characteristics of corn plants and the marks given for the two systems. Year 2017
Source: author's results.

Regarding the general appearance in non-irrigated system was rated note 7, and in irrigated system note 9. By the number of the plants which have come to be harvested, there are 12 at non-irrigated system plants and irrigation system to 64, with a number of 12, cobs 64 respectively. Yield in grains was 32%

and respectively 86%, and their humidity 20.4 18.6% respectively. Data and notes are included and in (Fig. 3 and 4).

CONCLUSIONS

The morphological characterization of the plant and corn cobs from the Olt hybrid led to the conclusion that it is recommended to cultivate this crop on those soils where the experiments have been made.

The irrigation system has a positive impact from all points of view on the studied morphological features, but keeping in mind that in this area there are a few places which could be irrigated, and the results of Olt hybrid in non-irrigated system were good.

The area is a poor location both from a thermal and hydric point of view in relation to the qualitative traits of this hybrid and the strength of the Fusarium attack as well as the breaking and falling. For this reason, this aspect should be taken into consideration in cropping. Due to the warm summers, physiological maturity of this hybrid is reached by the end of August making it possible an earlier harvesting, thus freeing up agricultural land as soon as possible in order to carry out the forthcoming agricultural works.

REFERENCES

[1]Axinte, M., Roman, Gh. V., Borcean, I., Muntean, L.S., 2006, Phytotechnics. „Ion Ionescu de la Brad", Publishing House Iaşi, pp.13-19.

[2]Cristea, M., Căbulea, I., Sarca, T.R., 2004, Corn. Monographic study, Vol., Romanian Academy Publishing House, Bucharest, pp.291-294.

[3]Haş, I., 2004, Technological features for maize culture in Transylvania, Boema Turda Publishing House, pp.21-45.

[4]Munkvold, G.P., Desjardins, A.E., 1997, Fumonisins in Maize: Can We Reduce Their Occurrence?, Plant Disease 81(6):556-565.

[5]Nelson, P. E., Desjardin, A. E., Plattner, R. D., 1993, Fumonisins: Mycotoxins produced by Fusarium species: Biology, chemistry and significance. Annual Review Phytopathology, 31, 233-252.

[6]Pandia, O., Sărăcin, I., 2009, The influence of the nitrogen and phosphorus doses on the production and the quality at the Zea Mays Everta Perlat 625, Research Journal of Agricultural Science, Vol.41(1):84-89.

[7]Pandia, O., Sărăcin, I., Tănasie, Ş. E., 2015, Zea Mais Everta Fundulea 625-health-income, Scientific Papers: Management, Economic Engineering in Agriculture and Rural Development, Vol.15(4):205-208.

[8]Ştefan, M., 2004, Corn, in Phytotechnics, Ion Ionescu de la Brad Publishing, pp.180

[9]Smith, S. N., Devay, J. E., Hsieh, W. H., Lee, H. J., 2001, Soil-borne populations of Fusarium oxysporum f. sp. vasinfectum, a cotton wilt fungus in California soils. Mycologia 93: 737743.

[10]Roman, Gh.V., Roman, A.-Maria., Ştirbu, C., 1991, Comparative study on methods for assessing corn thermal requirements, Scientific papers, IANB, series A, Vol. XXXIV, Bucharest, pp.73.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

INFLUENCE OF VARIETIES AND TECHNOLOGY UPON THE YIELD OF SEVERAL BARLEY VARIETIES GROWN IN THE SOUTH EASTERN PART OF ROMANIA

Nicoleta OLTENACU[1], Elena LASCAR[1], Cecilia NEAGU[1], Valentina GAVRILA[2]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania, Emails: nicoleta_oltenacu@yahoo.com, elenalascar@yahoo.co.uk, cecilianeagu2005@yahoo.com
[2]Probstdorfer Saatzucht Romania, Seeds Conditioning and Processing Station, Modelu Village, 917183, Phone/Fax: +40242318010. Emails: valentina.gavrila85@gmail.com.

Corresponding author: nicoleta_oltenacu@yahoo.com

Abstract

Barley (Hordeum vulgare), unlike other cereals, is distinguished by a wider geographical spread, being the only cereal that reaches 70 degrees North altitude. Barley provides the human body a wide range of nutrients: vitamins (B1, B2, B3, B6), minerals (selenium, manganese, iron, magnesium, phosphorus, zinc, copper) and dietary fibre. These qualities as well as many others make this crop constantly in the structure of crops. That is why, the research aimed at improving the quality of this plant is constantly evolving. Study of the behaviour in crop was analyzed, under the same technological and land and climate conditions, four varieties of Hanzi, Alora, Amorosa and Finola barley. The research was carried out during the year 2018, in the Southeastern part of the Romanian Plain. After harvest, determinations were made regarding the protein content, hectolitre weight, MMB and efficiency per hectare for each variety. The best efficiency was made by Hanzi variety that exceeded the production of the control variety by 30%.

Key words**:** *barley, hectolitrre weight, protein, varieties, yield*

INTRODUCTION

In Romania, the barley is one of the basic plants for crop rotation, being among the most common autumn crops [1]. Observing the technological steps is, however, very important, because without a good harvest, the barley is valued at lower prices [3]. Unlike the other cereals, barely (Hordeum vulgare) is distinguished by a wider geographical spread[10] . It is the only cereal it reaches 70 degrees North altitude[6]. Barley provides a wide range of nutrients to the human body: vitamins (B type: B1, B2, B3, B6), minerals (selenium, manganese, iron, magnesium, phosphorus, zinc, copper), food fibers [12]. These qualities as well as many others make this crop to be constantly in the structure of crops[11]. The interest in this crop led to the development of research on improving its quality and efficiency [9].

The main objective of the programs for the improvement of the plants is generally the creation of varieties and hybrids with high biological potential for high and stable production, as well as other favourable agronomic properties[2,8]. The characteristics of the varieties grown (yield potential, tolerance to biotic and abiotic factors, plant morphology etc.) can influence crop technology [7].

Also, tillage system optimization is an issue that concerns research and agricultural practice, considering the implications of the technological, economic and environmental impact of these elements [4]. Soil tillage should simultaneously ensure the conditions required by crop plants for growth and soil conservation [5].

MATERIALS AND METHODS

The study of the four varieties concerned the behaviour in crop as regards the yield and some qualitative indices (protein content, hectolitre weight, mass of one thousand MMB grains), in the soil and climate conditions in

the South-eastern area of the Romanian Plain. The analyzes were made on the material obtained from the harvest of 2018. The researches were organized on four variants, each variant with three repetitions, each with a surface of 150 square meters (Table 1). As a control variant, Amorosa variety was established to compare the results. The soil specific to the area is cernoziomic, formed of loess, which has nutrients and has the highest natural fertility for the plant crop in our country. Cambic chernozem has good agrochemical properties and a neutral pH that ensures satisfactory harvests even under non-fertilising and non-irrigation conditions.

Due to the good physical properties, high humus content and reaction favour the development of rich biological activities, mineralization of organic nitrogen and nitrate formation under natural conditions reach good levels.

The phosphorus regime is favoured by the weakly neutral reaction which keeps the phosphorus in a good state of both soil and fertilizer application, and its absorption by the plants is made in good conditions. Also, the restoration of the slightly soluble phosphate reserve takes place easily from the natural reserve of soil, which requires the use of phosphate fertilizers with good efficiency, with an average production increase of 15.0%.

The technology used was in the scarification work followed by a disk work concomitantly with DAP type fertilizer work. Sowing took place on 10th October. Chemical formulations of NH4NO3 were also administered at a dose of 200 kg in March and 200 kg DAP in April. Phytosanitary treatments were carried out with Biscaya insecticide, Menara fungicide and Mustang herbicide.

The climate conditions were characterized by precipitation below the multiannual average in the first six months of 2018, with a surplus of 124.3 l/square meter in July compared to a 77.8 mm multiannual monthly average. Also, the amount of precipitations in the years 2018-298.1 mm - was well below the values recorded in the previous years, but also compared to the average of the years 2012-2018 (512 mm).

During the sowing period, in October, there was 10.8 mm, well below the multiannual monthly average of 43.5 mm.

Table 1. Experimental variants

Variant	Variety
V1	ALORA
V2	AMOROSA- Mt
V3	HANZI
V4	FINOLA

Source: Own determination.

Alora variety is a modern variety of autumn barley, that was created especially for the climatic conditions of the dry regions of Eastern Europe, especially for our country. Alora variety ensures an early average baking and excellent production stability.

Amorosa variety is an early autumn barley variety with good stability in time, resistant to brown rust and septoriosis.

Hanzi variety is an autumn variety, suitable for well structured soils with high humus content and organic matter, ensuring high productivity. It shows good tolerance to rust.

Finola variety is a new, genetical Probstdorfer Saatzucht, highly productive, with superior quality indices.

RESULTS AND DISCUSSIONS

The varieties studied were analyzed from the efficiency point of view, both regarding the quality indicators and the productivity factors, such as the twinning degree and the number of spices per square meter.

Regarding the twinning degree, the varieties did not show significant differences (Table 2), the number of twins on the plant ranging from 6-7, a number of 6 twins being present in the control variety, Amorosa.

Table 2. Influence of varieties on twinning degree

Variety	No of twins/pl
AMOROSA-Mt	6
ALORA	7
HANZI	7
FINOLA	7

Source: Own calculation.

The determinations made regarding the density of spices per square meter revealed that all four varieties exceeded 650 spice / sq

m, the lowest number being registered at the control variant, 668 spice/sq m. The highest density was registered for Hanzi and Finola varieties, 685 and 686 spice / sq m respectively. Except for the control variant, all the other variants exceeded the average of 680 spice/sq m. The density differences were between 13-18 spice/square meter, as shown in Table 3 and Figure1.

Table 3. Influence of varieties on spices density

Variety	No of spices /sq m	Difference compared to control
AMOROSA-Mt	668.0	-
ALORA	681.0	13
HANZI	685.0	17
FINOLA	686.0	18
AVERAGE	680.0	12

Source : Own calculation

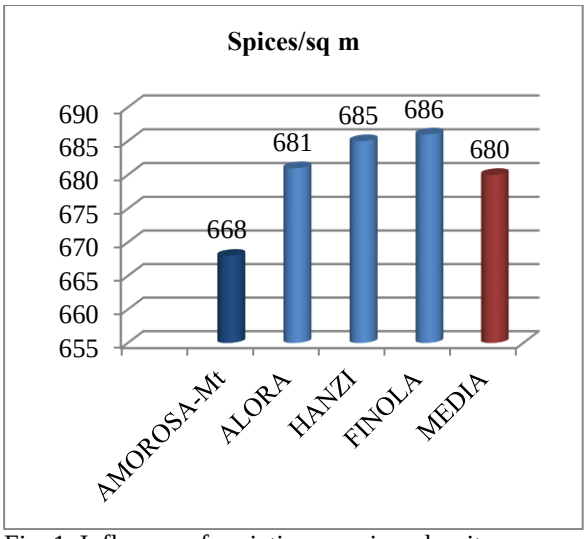


Fig. 1. Influence of varieties on spices density
Source: Own calculation

Analyzing the production obtained by the four varieties studied, from the point of view of the protein content, it was observed that the highest content in the protein was made by Amorosa variety, 15.0%. Being the variety established as control, we can conclude that all other varieties registered inferior results, the biggest difference being registered in Alora variety (-2.6%). Amorosa variety gained 1.4% and the average of the four varieties, 13.6%. Compared to the average value on experience, Alora and Hanzi varieties registered lower values of over 1.0%.

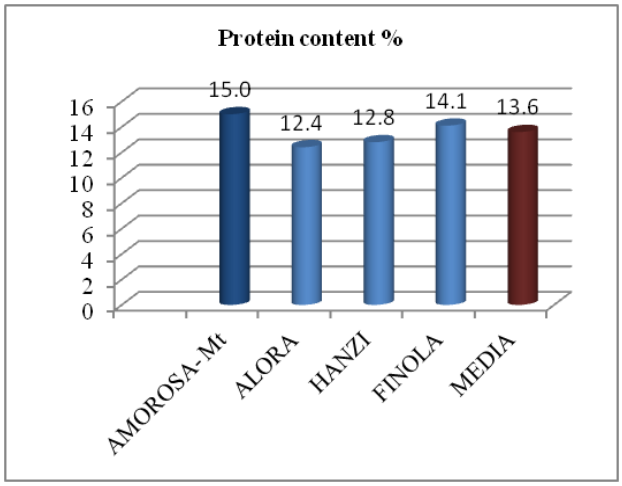


Fig. 2. Influence of varieties on the protein content
Source: Own calculation.

In conclusion, Amorosa variety has the highest protein content of the four studied varieties, 15.0%, followed by Finola variety by 14.1% (Figure 2). The lowest percentage was registered in Alora variety, 12.4% (Table 4).

Table 4. Influence of varieties on the protein content

Variety	Protein content %	Difference compared to control	Difference compared to average %
AMOROSA-Mt	15.0	Mt	-1.4
ALORA	12.4	-2.6	-1.2
HANZI	12.8	-2.2	-0.8
FINOLA	14.1	-0.9	+0.5
AVERAGE	13.6	-1.4	

Source: Own calculation.

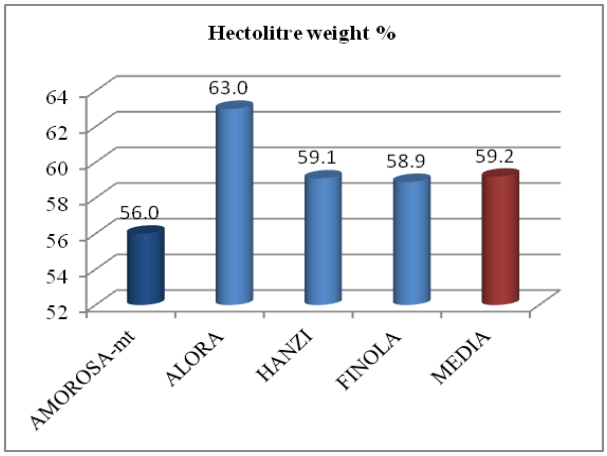


Fig. 3. Influence of varieties on hectolitre weight
Source: Own calculation

According to the Table 5, all studied varieties registered values of hectolitre weight above

the control value, 56.0%, with the highest addition to Alora variety, 7.0%.
The average value (59.2%) was exceeded by Alora and Hanzi varieties, which registered values of 63.0% and respectively, 59.1% (Figure 3).The lowest value was obtained in the control variety, Amorosa, 56.0%.

Table 5. Influence of varieties on hectolitre weight

Variety	Hectolitre weight %	Difference compared to control %	Difference compared to average %
AMOROSA Mt	56.0	Mt	-3.2
ALORA	63.0	+7.0	+3.8
HANZI	59.1	+3.1	-0.1
FINOLA	58.9	+2.9	-0.3
MEDIA	59.2	+3.2	

Source: Own calculation

The mass of one thousand grains registered values between 40.72 and 51.38 g. The highest value was observed in Finola variety (51.38 g) and the lowest in Amorosa variety (40.72 g). Compared to control, the highest difference was made by Finola variety, followed by Alora variety, 9.44%. The lowest result was obtained in Hanzi variety, 46.88 g and a difference of 6.16% compared to control (Table 6).
Compared to the average value of MMB, of the 4 varieties, the highest increase was registered in Finola variety, over 8.0% and the lowest in the control variety.
The soil efficiency results of the varieties revealed harvest differences. The highest production was registered in Hanzi variety, 7,664.8 kg.

Table 6. Influence of varieties on MMB

Variety	MMb g	Difference compared to control g	Difference compared to control %	Difference compared to average g	Difference compared to average %
AMOROSA-Mt	40.72	Mt	Mt	-6.58	-13.91
ALORA	50.16	+9.44	23.18	+2.86	+6.04
HANZI	46.88	+6.16	15.13	-0.42	-0.89
FINOLA	51.38	+10.66	26.18	+4.08	+8.63
MEDIA	47.30	+6.58			

Source: own calculation

The lowest efficiency was achieved in the control variety, 5,891.3 kg. The differences obtained compared to the control production were over 1,000 kg, statistically ensured as very significant, the biggest differences are those registered in Hanzi variety, 1,773.5 kg and Finola variety, 1,676.3 kg.
Compared to the average registered production, the differences were 564.4 kg for Hanzi variety, 467.2 kg for Finola variety and 177.6 kg for the Alora variety (Table 7).
Amorosa variety was the only one that did not exceed the efficiency made by the other varieties and their average production, the difference being very significant, 1,209.1 kg, which represents, in relative values, about 17% (Figure 4).

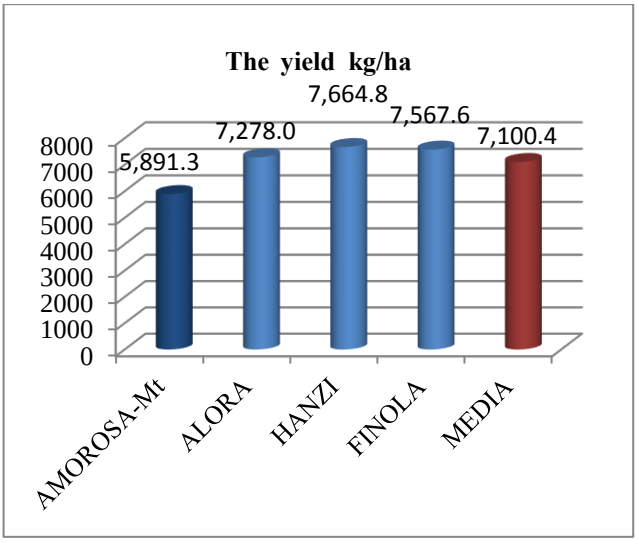


Fig. 4. Influence of varieties upon the yield
Source: Own calculation.

Table 7. Influence of varieties upon the yield

Variety	Prod Kg/ha	Difference compared to Mt kg	Difference Mt %	Significance	Difference average kg	Difference average %	Significance
AMOROSA-Mt	5,891.3	Mt	Mt	-	-1,209.1	-17.03	-
ALORA	7,278.0	+1,386.7	+23.54	***	+177.6	+2.5	*
HANZI	7,664.8	+1,773.5	+30.10	***	+564.4	+7.95	***
FINOLA	7,567.6	+1,676.3	+28.45	***	+467.2	+6.58	***
MEDIA	7,100.4	+1,209.1					

Dl 5%=171.0 kg/ha Dl 1%= 258.9 kg/ha Dl 0.1 %= 416.0 kg/ha
Source: Own calculation.

CONCLUSIONS

Analyzing the results obtained, it was found that, regarding the protein content, the highest was registered in Amorosa variety, 15.0 % and the lowest in Alora variety, 12.4 %. The difference from the control was -2.6 %.

Regarding the hectolitre weight, the most hectolitre-weighed variety is Alora, 63.0%, and the lowest-grain hectolitre is Amorosa 56.0 %. The difference between them was 7% and the lowest difference was 2.9 %, between control and Finola variety.

The mass of one thousand grains registered maximum in Finola variety, 51.38 g, and the lowest value was obtained in Amorosa variety, 40.72 g, the difference being 10.66 g. The lowest difference was 6.16 g made between control variety and Hanzi variety.

Regarding the efficiency obtained, it is directly proportional to MMB. As a result, the highest efficiency was registered in Hanzi variety, 7,664.8 kg followed by Finola variety with 7,567.6 kg. The lowest efficiency was achieved by Amorosa variety, 5,891.3 kg. The highest difference was registered between the control

variety and Hanzi variety, 1,773.5 kg. The lowest production difference was 1,386.7 kg registered between the control variety and Alora variety.

The production differences between the varieties compared to the control variant were in all cases very significant, which means that under the same technological conditions, the variety manifests its production capacity differently. Once again, the importance of improving and genetics for varieties and hybrids that show a high production potential, is confirmed.

REFERENCES

[1]Berca, M., 2000, Technologies improvement in agricultural crops, Ceres Publishing, Bucharest, p. 18-20.
[2]Berca, M. 2014, Modern technologies for wheat varieties Premium, Ceres Publishing, Bucharest, p.57.
[3]Drăghici, L., Bude, A., Sipos, G., Tusa, C., 1975, Barley, Academic Publishing RSR, Bucharest, p.120.
[4]Gus, P., Rusu, T., 2011, Unconventional soil tillage systems, agrotechnical and economical alternative for durable agriculture. In vol. Soil tillage systems. Cluj-Napoca, p. 11-23.
[5]Marin, D.I., Mihalache, M., Ciontu, C., Ilie, L., Bolohan, C., 2011, Influence of soil tillage on pea, wheat and maize crop in the Moara Domneasca-Ilfov area. 6th International Symposium - Soil Minimum Tillage Systems. Ed. Risoprint, Cluj-Napoca, p. 111-118.
[6]Mishra, B.N., Shivakumar, B.G. 2000, Barley. In: Techniques and management of Field Crop Production, Agrobios, India, pp. 478.
[7]Muntean, L. S., 1993, Plants crops, Vol. I. Agronomics Publishing Cluj-Napoca. p. 98.
[8]Oancea, I., 1994, General Agriculture, Ceres Publishing, Bucharest, p. 47-49.
[9]Oancea, I., 2004, Performing agricultural technologies, Ceres Publishing, Bucharest, p. 81.
[10]Percival, J., 1921, The wheat plant, Duckworth and co., London.
[11]Roman, G. V., Borcean, I., Muntean, L., Axinte, M., 2006, Plant crops, Editura Ion Ionescu de la Brad, Iaşi, p. 25.
[12]Ullrich, S.E., 2011, Barley: Production, improvement, and uses., Wiley-Blackwell, Ames, IA, USA, p. 37-40.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE IMPORTANCE OF KNOWLEDGE CONCERNING RESISTANCE TO DRAUGHT FOR SOME TYPES OF SEEDS CULTIVATED ON SANDY SOILS

Olimpia PANDIA[1], Ion SĂRĂCIN[2], Liviu OLARU[2]

[1]University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile:+40744 6474 10, Email: olimpia_pandia@yahoo.com
[2]University of Craiova, Faculty of Agriculture, 13 Alexandru Ioan Cuza Street, Craiova, code 200585, Romania, Phone: +40 251 414398, fax +40 251 411688, Emails: ion_saracin@yahoo.com, liviu.olaru.dtas@gmail.com

Corresponding author: olimpia_pandia @yahoo.com

Abstract

Climate changes that have taken place in recent years in our country have led to the desertification of arable land due to another phenomenon, namely the lack of irrigation systems, where the establishment of cereal crops has become an important issue to be debated. The smaller grain yields per unit area make them no longer profitable for farmers, and the land remains uncultivated and subjected to the aridity process. In the present paper it was presented the importance of knowing the germination period of some seeds grown in these dried areas, where the drying period after germination is induced by their resistance to drought and how many germinable grains remain viable. Experiences have been determined in the laboratory under natural conditions of temperature, humidity and brightness. The conclusion is that we must cultivate varieties or hybrids resistant to drought, diseases and pests.

Key words**:** *humidity, germination, hydric stress, biometric measurements*

INTRODUCTION

The study of plant response to climate change today characterizes the entire agricultural research, regardless of soil types. Maybe, however, sandy soils are of particular interest. Unfortunately, the lack of interest of decision-makers, perhaps of understanding, of Ministry of Agriculture and Rural Development (MARD), Ministry of Education and Research (MER), Ministry of Finance (MF) regarding the importance of such research, but especially the cost of such research, will cost us in the future much more! [7].

In order to better understand why the sandy soils are closely related to the drought, we start from the description given by S. Ciulache and Nicoleta Ionac, 2003 [4] that the drought is a complex meteorological phenomenon, characterized by the insufficient or total absence of precipitations corroborated with high air temperatures and high saturated saturation deficits extended over long periods of time, which is why many crops are compromised due to lack of water and irrigation systems.

The combined influence of the variety and the culture technology leads to changes in the main physiological characteristics that can influence the production of large quantities [5].

In 2017, Bonea Dorina presented in the paper "Effect of climatic conditions on corn yield and quality in the central part of Oltenia", an evaluation of the interaction of the x genotype in terms of yield and quality components of maize hybrids under different climatic conditions with reference to sandy soils [2]. The same author describes in his work in 2003 the influence of climatic conditions on grain yield and crude protein content in maize grains, with direct reference to the importance of knowing the accumulation of grain-based nutrients depending on the climatic conditions and the type of soil on which culture is established [3].

Since sandy soils are prone to longer periods of drought and lack of rainfall, the choice of

varieties or hybrids to be taken into culture must be given special importance. On sunny areas, sunflower is also cultivated, but the yields are small.

Thus, in 2009, Bonciu Elena, author of the book: Aspects of genetics and sunflower amelioration comes with research on the behavior of some sunflower genotypes that are grown under different conditions in the central area of Oltenia, [1].

Because the sands are unstable soils and have special technologies for their cultivation and cultivation, it is of particular importance recently the preservation and preservation of the sands, and the "The result of poor agricultural practices regarding the quality of the sandy soil in southern Oltenia" by I. Saracin and his collaborators, 2013, came with clarifications and recommendations in this respect [6].

MATERIALS AND METHODS

Laboratory method

To verify what was proposed, I decided to determine germination in some sunflower seeds, wheat, corn, sweet corn, rye, and oats.

From each batch we took 100 seeds and separate the sample for the blank. Before we were germinated we calculated MMB (mass of 1,000 grains) for each batch [8].

After the germination period, the germinated seeds were subjected to the natural drying process by interrupting the water soaking in different time periods, namely: 3-6-9-12 days.

After the biometric measurements and interpretation of the results, the seeds were seeded in the soil characteristic of the study area under the same conditions of temperature and humidity and laboratory conditions.

Since different measurements were made depending on the size of the root and the time of induced hydric stress, measurements were made for each variant of the plants remaining viable compared to the control which was not subjected to the induced drying time [9].

An important role in the crops set up on these soils is the dry matter, which was determined in the laboratory by drying, being also influenced by the drying time after germination and the culture under experimentation.

RESULTS AND DISCUSSIONS

In order to highlight the results obtained, the plants were studied with biometric measurements.

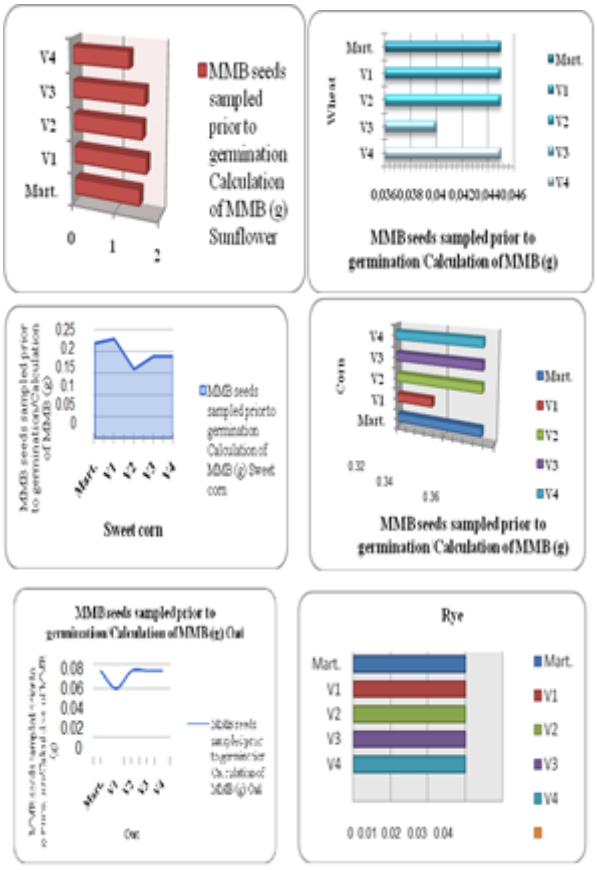


Fig.1. MMB seeds sampled prior to germination
Source: Authors' results.

The seeds were placed in Petri dishes on 05.02.2019, where they had substrate filter paper and wetted for germination. Room temperature was 21^0 C and air humidity 41%.

Photo 1. Sample preparation for determinations .
Source: Authors' experiment.

For proper germination analysis, the water content of each seed lot was determined at the beginning of the experiment, but also throughout the study period in order to establish the critical point of root penetration and measure it until germination was completed. During the germination period and until its completion, radicle measurements are made at each batch of seed where well-developed plants are selected and transferred to vessels containing the argiloiluvial soil collected from the farm. We say the hydric stress period according to the desired period: 3.6.9.12 days, during which biometric measurements are made.

The percentage of viable plants for each batch of seedlings is shown in the Figure 2 where it can be seen that the differences obtained for each crop are influenced by the different time allowed for drying, but also by the size of the radicle, respectively, of 0.4 and 3 cm.

For this reason, it can be noticed that the germ-seed sunflower starts from 97.5% for the size of the root of 0.4 cm and decreases to 73.8 for a 12-day break. The higher the root of 3 cm, the lowest the drying time is 56.2.

In Olt corn, at a 0.4 cm root, the viable plants decrease 87.5 for 3 days rest until 75.4 for 12 days rest. For a 3 cm radius, the smallest value is met at the 12-day rest of 58.3.

The maize is recorded for the 12-day rest but with a 0,4 cm radius the value of 70.1 viable plants in a slight decrease for the same period but with a 3 cm root of 57.8.

For Glosa wheat, viable plants decrease as the drying time increases, and for a 0.4 cm radius, the highest value has a 3-day break of 85.2 and 76.3 for a 3 cm radicle.

In the Matador grape variety, the differences in viable plants are smaller, being a variety suitable for this area and even if there are drought periods of over 12 days, the lowest number of viable plants is found at the 3 cm corner, 8 and the highest of 98.8 at the root of 0.4 cm.

Mureşana Oats, performed well with results of 81.5 viable plants for a root of 0.4 cm and 60.8 for a root of 3 cm but for 12 days of drought.

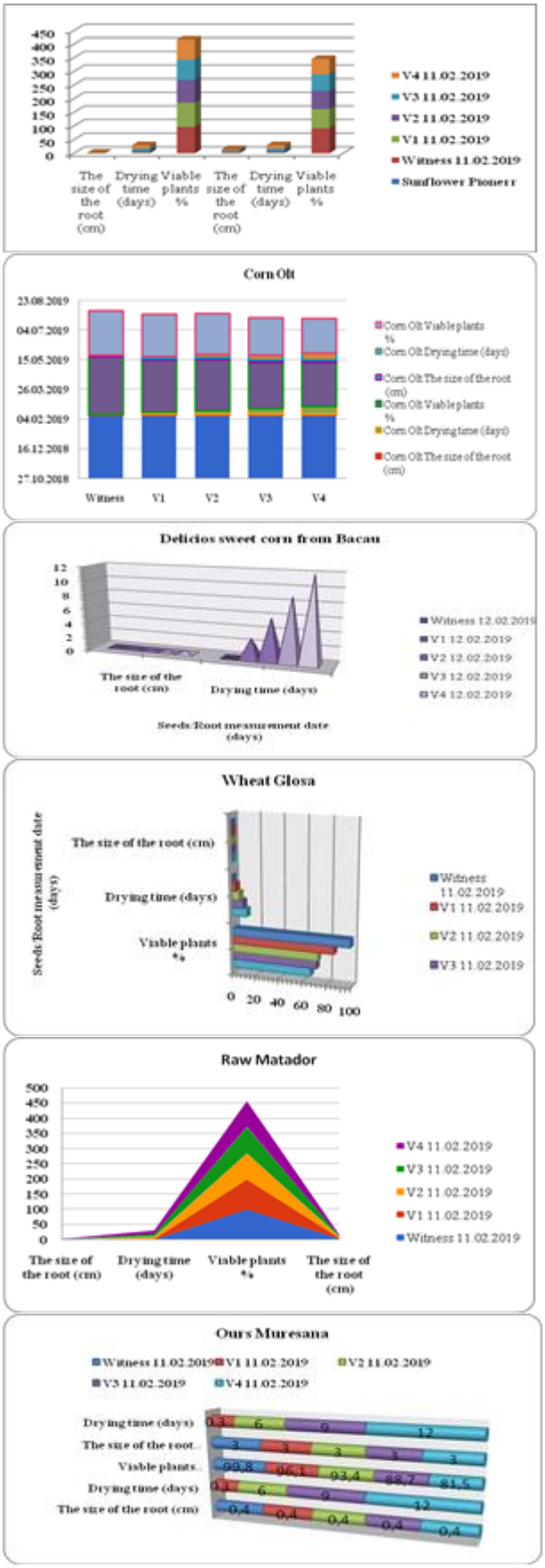


Fig.2. Radicle measurement and percentage of viable plants for the specified period
Source: Authors' results.

Photo 2. Measurement of the root in the studied seed
Source: Authors' results.

The need to demonstrate the importance of the varieties, hybrids or crops that are set up in these dried areas makes it necessary to know the determinants of the continuation of vegetative flow after germination.
Thus, it was determined: (i)Moisture of the sprouted grains before drying; (ii)Moisture of the grains germinated after drying; (iii) Concentration of root cell juice.

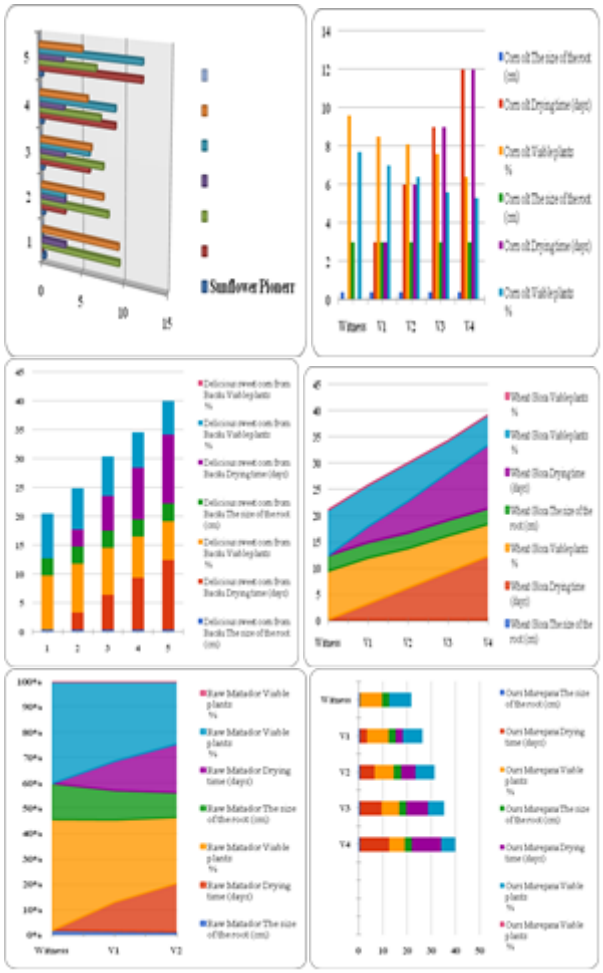


Fig.3. Determination of the humidity of the sprouted grains
Source: Authors' results.

Depending on the size of the radicle and the drying time that are influenced by the water absorption process, we determined the concentration of the existing cell juice in the embryonic roots.

Photo 3. Detremination of the humidity of the sprouted grains
Source: Authors' results.

From the graphs shown above, the humidity of the grains measured after drying is different depending on the size of the radicle and the drying time subjected to water stress.
Thus, humidity decreases in all the corn batch lots, where from 8.5 drops to 6.4 for a 0.4 cm root and 8.4 corn to 6.8.
But the sunflower behaves differently, so at a 0.4 cm radius, the maximum moisture value is 8.2 compared to the 3 cm radicle where the value is 5.2.
Rice, oats and wheat meet slightly descending values depending on the size of the root and the water-standstill.
The smallest values are found in all batches where the rest period is 12 days.
The seeds that resisted during this period are transferred to other Dabuleni soil pots and seeded at a depth of 2.5-3 cm in the same natural environment, not before establishing

the main agrochemical elements existing in the soil.

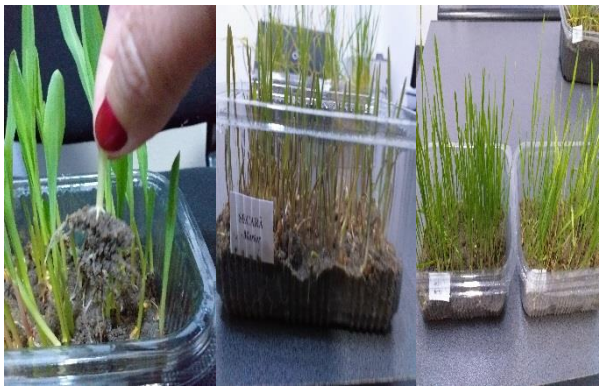


Photo 4. Transfer of seed germinated into sandy soil
Source: Authors' results.

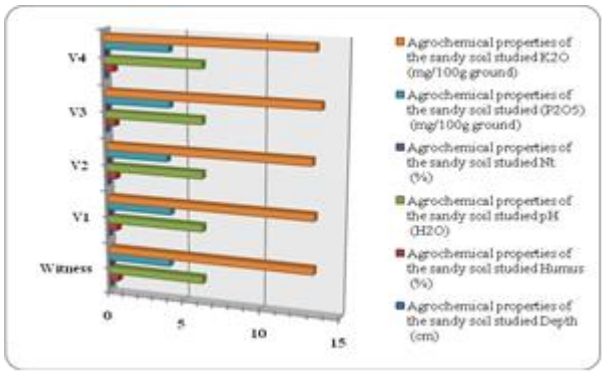


Fig.4. Agrochemical properties of the studied sandy soil

Source: Authors' results.

The results obtained from these measurements were strongly influenced by the vegetative continuity of the seeds after the drying period. Even if the size of the root is the same for each plant, some lose their properties while the sowing time passes.
The same phenomenon occurs during the growing season in the field, when the crops are water-free, which leads to compromised crops, which exhibit plant intakes on the surface unit, low and low quality crops.

CONCLUSIONS

After knowing the results obtained in the laboratory, we can formulate the following conclusions:
Drought resistance of crops depends very much on the germination period and after germination.
The well developed root system leads to viable, strong and resistant crops.
The soil-resistant species studied were:
Sandy soils through flawed exploitation and improper use of fertilizers can completely compromise crops when drought occurs.
It is necessary to cultivate varieties or hybrids that are resistant to drought, diseases and pests.

REFERENCES

[1]Bonea, D., 2017, The effect of climatic conditions on the yield and quality of maize in the central part of Oltenia, Annals of the University of Craiova-Agriculture, Montanology, Cadastre Series, Vol.46, (1):48-55.
[2]Bonea, D, Urechean, V., Naidin, C., 2003, The influence of climatic conditions upon the grain yield and the content of raw protein in the maize grain, Maize Genetics Cooperation Newsletter, Vol.77, pp. 68.
[3]Bonciu, E., 2009, Aspects of Genetics and Sunflower Enhancement, Sitech Publishing House, Craiova, pp. 182.
[4]Ciulache, S., Ionac, N., 2003, Dictionary of Meteorology and Climatology, Ars Docendi Publishing House, Bucharest.
[5]Lacatus, V., 2016, Fruit growing in the "triangle" of sandy soils, Symposium "Influence of climate change on fruit growing in sandy soils. Research and Development Objectives for the Period 2016-2025", 25 may, CCDCPN Dăbuleni.
[6]Pandia, O., 2006, Research Regarding the Effect of Fertilizers upon Maize Production and Quality, Ph.D. Thesis, University of Agronomic Sciences and Veterinary Medicine of Banat, Timisoara.
[7]Research Institute for Soil Science and Agro-chemistry (ICPA), 1976, Soil Agrochemical Analysis Methodology, ASAS, Bucharest.
[8]Research Institute for Soil Science and Agro-chemistry (ICPA), 1980, Plant Analysis Methodology for Assessment of Mineral Nutrition Status, ASAS, Bucharest.
[9]Saracin, I., Pandia, O., Gheorghe, M., 2013, The result of inappropriate farming practices on the quality of sandy soil on South Oltenia, ProEnvironment/ProMediu 6 (2013) Bio Flux, Cluj Napoca, pp. 459-462.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE IMPORTANCE OF KNOWLEDGE OF FOLIAGE SURFACE INDEX (ISF) INFLUENCE ON PRODUCTION

Olimpia PANDIA[1], Ion SĂRĂCIN[2], Liviu OLARU[3]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile:+40744 6474 10, Email: olimpia_pandia@yahoo.com
[2]University of Craiova, Faculty of Agriculture, 13 Alexandru Ioan Cuza Street, Craiova, Code 200585, Romania, Phone: +40 251 414398, Fax: +40 251 411688, Emails: ion_saracin@yahoo.com, liviu.olaru.dtas@gmail.com

Corresponding author: olimpia_pandia @yahoo.com

Abstract

This paper comes from a study of four maize hybrids sown in Amărăşti de Jos Commune, Dolj county, which were cultivated in different variants of plant density per hectare, in order to determine the influence of the foliar system on the average grain production returns per 1 dm^2 of leaf, knowing that the number of leaves denotes the vigour of the plant, but with influences on the vegetation period. The four hybrids have been selected for their resistance to water and thermal stress that is established in the S-V Oltenia areas, and the Olt hybrid is the most demanded by farmers to be cropped. As a result of the biometric determinations, all four hybrids behaved very well to the hydro and thermal stress conditions, but the Olt hybrid showed the most significant results for each determined element.

Key words**:** *hydric, thermal stress, hybrid, foliar surface*

INTRODUCTION

Knowing and using the climatic resources in agriculture is an important source of growth in plant and animal production [2] and agro-climatic risk management.
In this context, the superior valorisation of the entire climatic potential of a certain geographical region, as well as the knowledge of the risks affecting the harvest, is one of the basic conditions of its sustainable develop-pment in economic and social terms [1].
So knowing and recommending to culture the most valuable hybrids is of major importance to farmers. Due to the sandy soils that predominate in S-V Oltenia, the adaptation of these hybrids or the attempt to make a selection only for those who are resistant to water and heat stress is necessary [6, 9].
By increasing the number of plants per square meter there is a significant increase in both the foliar surface obtained by all the plants per unit area (square meter), expressed by the index of the foliar surface, and the total number of grains obtained by a greater number of cobs / square meter. The direct relationship of the two productivity elements with the sowing density has as its limit the decrease of the production produced by the plants [10]. Environmental factors have a greater influence on the protein content of bean protein-rich hybrids than on the protein content of normal hybrids. The use of hybrids adapted to the crop area allows for significant quantitative and qualitative production with satisfactory economic efficiency. The high production potential of selected hybrids can bring a guaranteed profit in the case of an agricultural year with modest rainfall and loss of plants due to excessive environmental conditions [4]. In the paper, Aspects on the Concept of Stress, Heat and Drought in Corn Cultivation, [5] presented the concept of modern hybrids that have been greatly improved for stress-producing production in bloom. In a recent study, 18 hybrids recorded between 1953 and 2001 (about 3 hybrids/ decade) were tested for about 50 days under non-irrigated conditions, with only precipitation water. The genetic gain per year during this period was under non-stress conditions (211 kg ha/yr) with 41% loss in

blooming stress conditions and up to 77% under stressful conditions when filling grains.

MATERIALS AND METHODS

The studies were conducted in 2017 in the commune of Amărăşti de Jos in Dolj county, more precisely at the agricultural company SC Flamura SA, an unit that takes care of 85 ha of agricultural land, cultivated with various cereal crops in which maize culture holds the highest share. Due to the climatic and soil conditions existing in this area, the plant needs the knowledge of maize hybrids that can be sown under existing conditions. Four maize hybrids: Olt, DKC were studied. 3409, Biocrop, and Kapitalis FAO 410, which were sown in four variants on different densities, namely: 100/31.25 to 50,000 plants/ha; 100/ 43.75 to 35,712.5 plants/ha; 100/56.25 to 27,750 plants/ ha; 100/68.75 (22,750 plants/ ha). In order to determine the number of leaves, the biometric method [8] was used, where average samples of each variant were taken at 100 plants. The value of the correlation coefficient was also determined (± r). Depending on the average foliage area and the yield of the grains on the obtained plant, the amount of grain expressed in grams per hectare of each leaf dm^2 was calculated.

RESULTS AND DISCUSSIONS

For better experimentation, a new hybrid Kapitalis FAO 410 hybrid was taken separately, with high genetic value but also high resistance to water and heat stress. It was cultivated on different densities: 100/31, 25 to 50,000 plants/ha; 100/43.75 to 35,712.5 plants/ha; 100/56.25 to 27,750 plants/ha; 100/ 68.75 (22,750 plants/ha).

Depending on these densities, correlations were made on the average number of leaves per plant, the calculation of the average leaf area of a plant expressed in dm^2, the calculation of the grain production on a plant expressed in grams, the calculation of grain production in kg/ha, the calculation of the coefficient expressed in grams of grains for 1 dm^2 of the leaf and the calculation for the correlation between the foliar surface and the grain production [3].

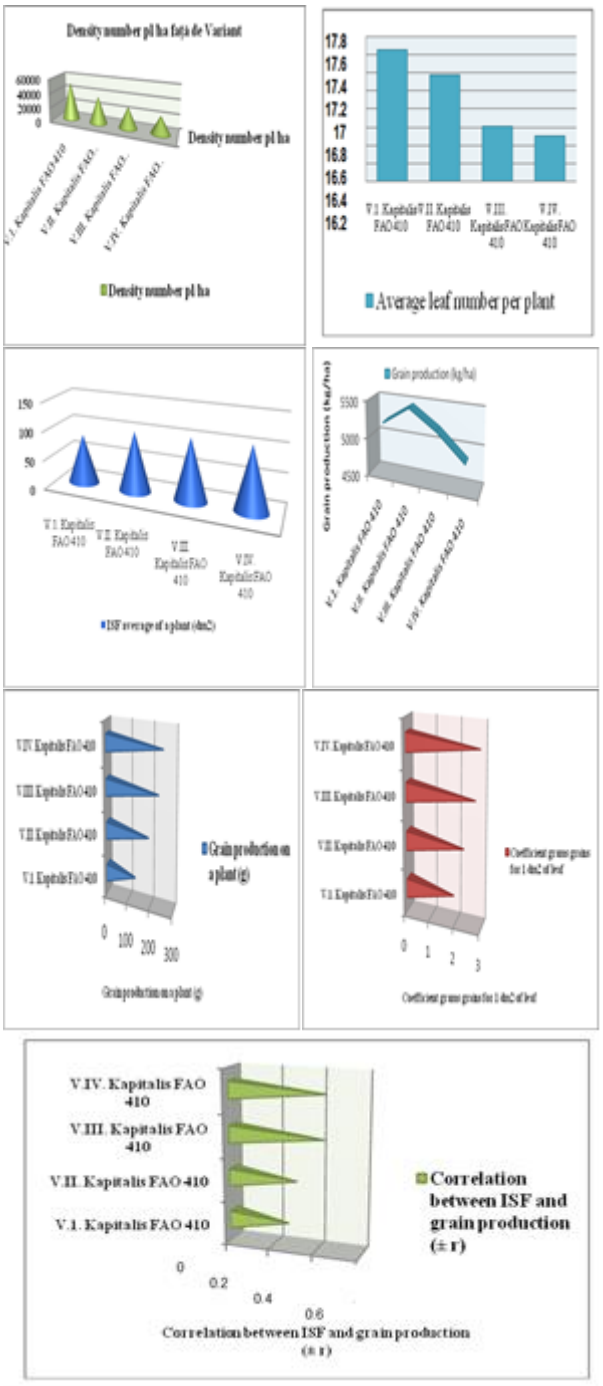


Fig.1. Correlation between the foliar surface and the grain production
Source: Authors' results.

From the data we can see that the number of leaves is influenced by the density of the plants, so in variant I we have the highest density of leaves per plant, respectively 17.65, but also the number is influenced by the leaf size which for these variants is less than

85.2375 dm2, and the second variant having a density of 35,712.5 plants per hectare, the foliar surface is 104.075 dm2.

With the growth of foliar surfaces for variants III and IV, the average number of foliar surface index decreases from 16.8125 to 16.7 for variant IV but we have a more vigorous vegetative growth because of the lower plant density per hectare and thus the foliar average surface area reaching version III with 106.8625 to 108.7125 dm2.

In the case of the calculation of average grain yields expressed in kg/ha, the results obtained show that at low plant density per hectare, production decreases, the highest production is recorded in variant II with 5,445 kg of berries and the lowest at variant IV with a density of 22,750 plants per hectare, the yield of berries is only 4,847.5 kg/ ha.

Grain yields on one plant are those with the highest plant area, and in terms of grain weights per 1 dm2 of leaf, the best results are found in the more vigorous plants, respectively, for variant IV with 2.9 g/dm2 of leaves and is continuously decreasing II followed by variant III and variant I showing the lowest value respectively 1.9 g/dm2 of leaf.

The ratio between the foliar surface and the grain production shows a significant increase from the first variation to the IV variant when the value is 0.435.

Other three hybrids, Olt, DKC 3409 and Biocrop were also taken into consideration for the reasoning of the proposed ones. DKC 3409 and Biocrop hybrids were also characterized for their resistance to water and thermal stress [7].

It was noticed that the Olt hybrid is most often taken in culture in this area with good results being adapted for soil and climate conditions in Amărăşti de Jos, but also the experimentation of the other two hybrids that besides the qualities of the Olt hybrid also have increased resistance against diseases and pests.

For these hybrids, only two densities were taken, namely 50,000 plants per hectare and 22,750 plants per hectare.

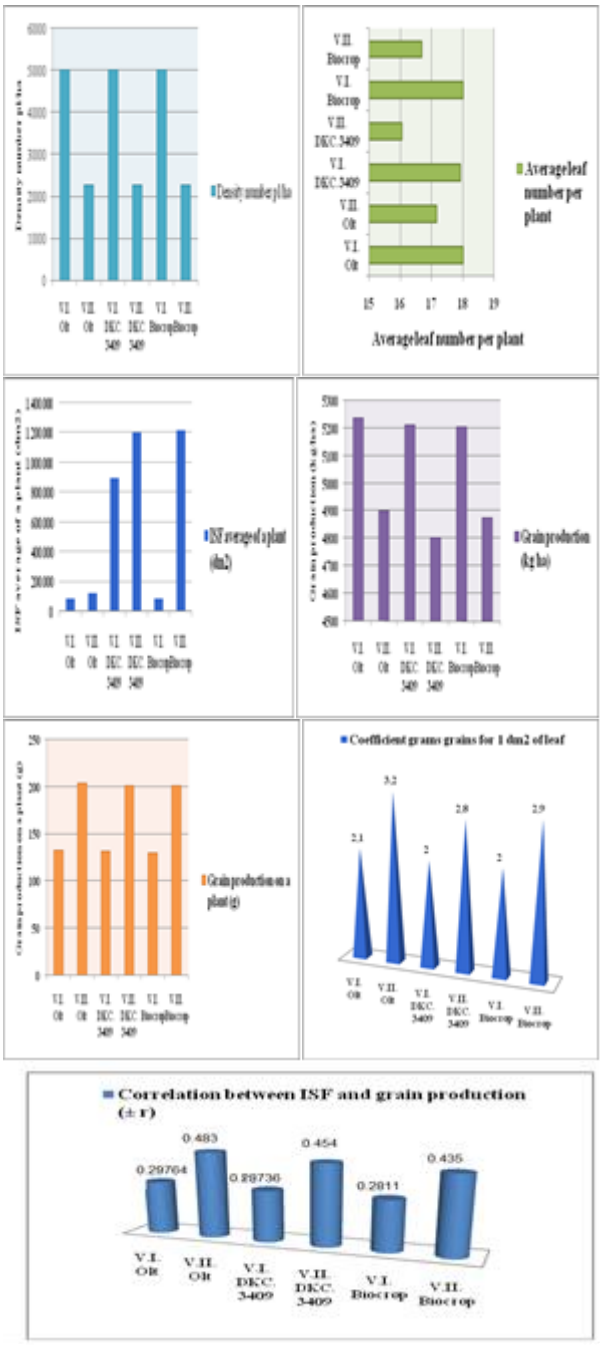


Fig.2. The correlation between the foliar surface ratio and the grain production for the Olt, DKC 3409 and Biocrop hybrids
Source: Authors' results.

From the data obtained for the three maize hybrids experimented on minimum and maximum densities from the Kapitalis FAO 410 hybrid, the best results were obtained by the Olt hybrid at a density of 50,000 plants per hectare in terms of the average number of leaves per hectare which was 18.2 versus the density of 22,750 plants per hectare with an average leaf count of 17.17.

The other two hybrids with 17.92 and 16.5

respectively for the DKC hybrid recorded a slight decrease for this item. 3409 and 18.01 and 16.7 for the Biocrop hybrid.

To study the average ISF of a plant per dm2 of the three hybrids the best results are obtained by the Olt hybrid at a density of 50,000 plants per hectare with a significant increase for the density of 22,750 plants per hectare where the values reach 122.514 at 121.9870.

Depending on plant vigour and vegetative system, grain production expressed in kg/ha is positive for high density variants and 5,236.47 respectively for the Olt hybrid followed by the DKC hybrid. 3409 and Biocrop with 5,201.47 kg berries per hectare.

Regarding the density of 22,750 plants per hectare, the results are decreasing, so the Olt hybrid has a value of 4,898.32 kg/ha compared to 4,847.5 recorded in the Biocrop hybrid. Also, the single-plant grain yield element was studied, the best values are obtained at the highest studied density, and the Olt hybrid has the highest value of 132.312 g with a slight decrease in the DKC hybrid 3409 of 131.615 and Biocrop with 129.871g, instead of studying the same element at lower density production is upward from the Olt hybrid to the other two hybrids studied from 203.6 g to 200.4 and 200.5 g respectively.

Calculation of the grain ratio in relation to 1 dm2 leaves the Olt hybrid to record positive results for both densities, namely 2.1 and 3.2 g/dm2. Calculation of the correlation between ISF and grain production makes all Olt hybrids achieve positive results at a density of 50,000 plants per hectare, ranging from 0.29764 to 0.28110 for the Biocrop hybrid. Not the same result is recorded at the density of 22,750 plants per hectare where the values increase; the Olt hybrid has the value between 0.483 g, DKC. 3409 g has a drop value of 0.454 g, and Biocrop reduces slightly to 0.435g.

From these biometric determinations, hybrids that are more experienced than the Olt hybrid have lower values but can be taken in culture because the foliar appliance is well developed and can provide high yields in water and thermal stress deficiency areas.

CONCLUSIONS

After studying the four maize hybrids sown in Amărăşti de Jos, there were noticed many important elements that make them to be cultivated in the dried areas., existing in the South - West Oltenia.

The most important element to take into account is the density of the plants per hectare where the Olt Hybrid obtains the best results followed by the Biocrop hybrid.

The grain yield reported for the four hybrids is a normal production characteristic for them and deserves to be taken in cropping but for high plant density relative to the surface unit.

The well-developed foliar system gives rise to vigorous plants and a large grain production.

It is recommended that all the three new hybrids with good genetic dignity to be promoted and in addition, the Olt hybrid has a great capacity to adapt to this area and resist against diseases and pests.

REFERENCES

[1]Bogdan, O., 1999, Key Climatic Characteristics of the Romanian Plain, "Geography Communications", III, Bucharest University Publishing House, pp. 267-281.

[2]Gloyne, R. W., Lomas, J., 1980, Lectures Note for Training Class II and Class III Agricultural Meteorological Personell, W.M.O., Geneva, Switzerland, pp. 260.

[3]Hash, V., Hash, I., Tokatilis, I., Mylonas, I., 2008, Analysis of some parameters in the realization of the production potential and capacity in maize, INCDA Fundulea, Vol. LXXVI, pp. 134.

[4] Melut, L. C., Dincă, V., Mandache, V., 2011, Risks involved in the cultivation of hybrids of maize (Zea Mays L.) in water and heat stress conditions in the North-East of Romania, Scientific Papers, Agronomy Series, Iaşi, No. 54.

[5]Melut, L. C., Dincă, V., Mihai, Tr., 2014, Aspects regarding the stress, heat and drought in maize crop, Agricultura Transilvana Journal, No. 21.

[6]Pandia, O., 2006, Research Regarding the Effect of Fertilizers upon Maize Production and Quality, Ph.D. Thesis, University of Agronomic Sciences and Veterinary Medicine of Banat, Timisoara.

[7]Povară, R., 2005, Utilization of the Thermal Potential of Oltenia Field in Agriculture, Annals of Spiru Haret University, Geography Series, no. 8, pp. 34-40.

[8]Research Institute for Soil Science and Agro-chemistry (ICPA), 1980, Plant Analysis Methodology for Assessment of Mineral Nutrition Status, ASAS, Bucharest.
[9]Saracin, I., Pandia, O., Gheorghe, M., 2013, The result of inappropriate farming practices on the quality of sandy soil on South Oltenia, ProEnvironment/ProMediu 6(2013) Bio Flux, Cluj Napoca, pp. 459-462.
[10]Vătămanu, V., 2015, Density of corn plants, an important technological element, AgriMedia Magazine, No.5, pp. 12.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE NATURAL MOVEMENT AND THE RISK OF POVERTY - A REFLECTION OF THE RURAL POPULATION'S LIVING STANDARD IN ROMANIA AND THE SOUTH MUNTENIA REGION

Ionut Daniel PETRE

University of Agricultural Sciences and Veterinary Medicine, Bucharest, 59 Marasti, District 1, 011464, Bucharest, Romania, +40213182564, Fax: +40213182888, Email: ptr_ionutdaniel@yahoo.co.uk

Corresponding author: ptr_ionutdaniel@yahoo.co.uk

Abstract

The paper aimed to analyze the situation of the natural change of the population in close connection with the risk of poverty or social exclusion in the period 2007-2017 both in Romania, rural Romania and in the South Muntenia region and the rural South Muntenia. The data were collected from Tempo Online data base of the National Institute of Statistics and the main methods utilized in the research have been: index method, comparison, analysis and synthesis, correlation and regression. In Romania and in its territory the population is facing with a continuous decline regarding the number of births and natality and an increased number of deaths and a high mortality rate. As a result the population change has a negative value which is higher a higher froma year to another. A similar situation was found in the South Muntenia, considered a very poor region, where 44 % of the population lives in the rural areas and the incomes are small coming mainly from agriculture. In the rural South Muntenia, the population declines, and the births are lower, and mortality is higher. In 2017, the natural population change in Romania accounted for -55,910 and in the rural Romania for -44,653. In case of the South Muntenia region, the natural change of the population was also negative and increased to -16,161, and in the rural areas it reached -13,264 in 2017. Romania registered 35.7 % risk of poverty and the South Muntenia a much higher one 40.9 % in 2017. Despite that there was noticed a decreasing trend in the analyzed period, the poverty is still high in Romania and mainly in the rural areas. The negative natural change of the population was caused 52 % by the high risk of poverty and social exclusion, as proved by the correlation coefficient (r=0.718) and regression function, Y= 2,263.065 X -140,307. The Romanian Government has to establish an efficient strategy to reduce the poverty risk or social exclusion in order to improve the natural population change and the living standard both in the urban and rural areas.

Key words**:** *natural population change, rural population, risk of poverty, South Muntenia region, Romania*

INTRODUCTION

From "the economy of nature and causes of the nations' health" as approached Adam Smith, from "the laws which regulate what is produced on the Earth" as sustained David Ricardo, and from the laws of capitalist economy" as formulated Marx, economy has become a science whose purpose was to study "human behaviour in relationship with its finalities and the various means used" as sustained Robins, and at last economy has become "a study of the principles which governate the efficient allocation of resources, when both resources and needs are known. More than this, Marshall affirmed that the capacity to grow children and the limited space are among the factors which determine natality rate in any society", as affirmed Mark Blaug in his "Economic Theory in Retrospect" [1].

Across the time, various theories on demographic transition such as the ones developed by Warren Thompson (1929) and Frank Notestein (1954), and later by Jean-Claude Chesnais (1986), reflected the importance of natality and mortality in various societies from the pre-industrial economy to the modern one.

The reality showed that in the developed countries, natality and mortality have low values, while in the developing countries natality and mortality are high.

Since the '60s, new demographic behaviours have started to develop. The marriage comes later or becomes rare, and the divorce is more

frequently observed. The traditional families are changing under the social pressure, and people are more focused on the individual needs and purposes. The family model changes from an altruist one to an individualist one, where the professional carreer is more important, and children play a more modest role in the family life.

Therefore, nowadays, in the developed countries, natality goes down, the living standard is high and in consequence mortality declines. In the less developed countries natality and fertility could be either high or low, despite that the living standard is low, but mortality is always high [9].

The statistics proved that the population registers variations regarding the number of persons, demographic structure by age, gender, environment, education level and also regarding its dispersion in the territory. Therefore, the population system is facing with "input" and "output" flows, which reflect the natural population change, in terms of natality and mortality, and the migratory movement.

The fundamentals of the natural change of the population are "natality" and "mortality".

Natality is "the ratio between the number of births and the population in a given period of time and community". Mortality is "the ratio between the number of deaths and the population in a territory and interval".

Natality is usually reflected by "the number of live births per 1,000 inhabitants", while mortality represents "the number of deaths per 1,000 inhabitants".

The difference between natality and mortality has three forms: (a) *natural population increase*, when the number of live births is higher than the number of deaths in the considered period, and (b)*natural population decrease*, when the number of deaths is higher than the number of births, and the results is a negative one. Sometimes, births could be equal to deaths and in this case the result is zero.

The rate of the natural gain (NGR) is the difference between the natality rate (NR) and the mortality rate (MR), according to the formula: NGR= NR - MR [5, 10].

In 2015, Romania had 19.8 million inhabitants, which means 3.88 % of the EU population. Romania has a better age structure to the EU., because 17 % of the population is older than 65 years while in the EU it is 18.9 %. However, the truth is that most of the EU countries are facing with population aging.

Besides other factors, fertility rate which influences natality, is 1.5 in Romania compared to 1.6 in the EU.

The living standard in Romania is one of the lowest in the EU, reflected by Euro 16,500 GDP/inhabitant compared to the EU average accounting for Euro 28,900/capita.

The poverty rate in Romania is very high, 19.8 %, compared 10.8 %, the EU average [23].

While in 50% of EU countries, the population continues to grow, in 14 member states there are recorded negative rates of natural change. The natural deficit per 1,000 inhabitants accounts for -6.5 in Bulgaria (-6.5), -4.1 in Croatia and Latvia, -4 in Lithuania, -3.8 in Hungary and -3.6 in Romania.

However, besides the natural population growth, the population change is also determined by migration for various reasons, especially the desire to look for a job or a better paid job and a higher living standard.

The decline of the population in Bulgaria, Latvia and Romania is caused mainly by the negative population change to which we must add the low negative rate of net migration. The causes are the poverty in many areas, the lack of jobs, the low income per family, and the low living standard both the urban and mainly in the rural areas [6].

In this context, the goal of this investigation was to analyze the population change in Romania and also in the South Muntenia region of development, pointing out the situation in the rural areas in the period 2007-2017. In this purpose, the statistical data put at the disposal by the National Institute of Statistics in terms of births, deaths, natality, mortality, natural change have been processed in relationship with the risk of poverty and social exclusion.

The hypothesis of this analysis is: "Is any positive relationship between the population

change and the risk of poverty or social exclusion?"

MATERIALS AND METHODS

The South Muntenia region is one of the development regions of Romania, where GDP represents
less than 75 % of the EU average [22].
In this part of Romania, agriculture is practiced on about 71 % of its surface. Therefore, agriculture is the main activity providing income to the agriculturists' families, and assuring them a decent living standard [2].
In this region like in many other areas of Romania, agriculture is mainly oriented to vegetal production, cereals and oilseeds crops being successfully cultivated both for the domestic market and for export [12, 14, 16, 17, 18].
The main features of the labour force in agriculture are the high contribution of the family members to the agricultural works, the self-employment, the low training level and low productivity with a deep impact on production performance and product quality [15].
The low performance in agriculture is due to the small farm size, the applied technologies, the old infrastructure, business management which have a negative impact on the sustainable development of the area, but this is also a general characteristics in the whole country [8].
Also, besides South Vest Oltenia, South Muntenia is one of "the poles of poverty" in Romania in close relationship with fertility, natality, mortality, migration, income per household, and living standard [11, 24].
The study is based on various range of information sources, empirical data picked up from the official data base of the National Institute of Statistics, published articles in well known journals and internet sites on the topic.
The analysis was running between 2007 and 2017 reflecting the changes carried out during the last decade in Romania and the South Muntenia region.
The main indicators studied in this research article are: the number of births, the number of deaths, natality rate, mortality rate, the population natural change, and the rate of the risk of poverty and social exclusion.
According to National Institute of Statistics, the natural movement of the population includes: natality, mortality, nuptiality, divorcing, and natural change.
Natality rate (NR) is the number of live births (LB) registered in one year divided by the population (P) existing at the date of July 1st in the current statistics and reflects the number of live births per 1,000 inhabitants, according to the formula:

$$NR = (LB/P)*1,000 \quad (1)$$

Mortality rate (MR) is the number of dead persons (D) in a year divided by the population (P) existing at the date of July 1st in the current statistics and reflects the number of deaths per 1,000 inhabitants, according to the mathematical formula:

$$MR = (D/P) *1,000 \quad (2)$$

The natural change of the population (NCP) si the difference between the number of live births (LB) and the number of dead persons (D) in the reference year, according to the formula:

$$NCP = LB - D \quad (3)$$

These indicators were studied at the level of Romania, in the South Muntenia region, and also in the rural areas.
The methodology included the comparison method, the index method, the structural index, and regression function, the results being interpreted leading to pertinent conclusions.

RESULTS AND DISCUSSIONS

The dynamics of South Muntenia Region's population and rural population

If we look at the data reflecting Romania's population, we may notice a declining trend. In 2017, Romania had 22,202 thousand inhabitants compared to 22,563 thousand persons in 2007, representing a loss of -1.6 %.
The decline of the population in Romania is similar to the one in Bulgaria and Latvia, and

this phenomenon is caused especially by the negative population change and also by the high migration rate [6].

Romania is characterized by a high number of inhabitants living in the rural areas and more than this, the share of the rural population in Romania's population continue to increase from 43.2 % in 2007 to 43.7 % in 2017, despite that the number of inhabitants in the rural space declined by 0.6 % from 9,744 thousand people to 9,690 thousand people in the same interval [21].

The statistics proved that rural population in Romania is an important resource of workforce, but the main features of its structure are: aging, low training level, low productivity, and low income per family [13, 15, 19].

In Romania, it is also a big difference regarding the rural population and urban population, regarding demographic change, education level, income level and living standard [20].

In the analyzed period, the population of South Muntenia region recorded a similar descending trend like at the national level. From 3,395 thousand people in 2007 it accounted for 3,252 thousand people in 2016, meaning a decline by 4.3 %. But, in 2017, the population of the region has started to increase, being 3,395 thousand persons like in 2007.

Therefore, the number of inhabitants South Muntenia region declined much more than at the level of the country (Table 1) [11].

Table 1. The dynamics of Romania and South Muntenia Region's rural population in the period 2007-2017 (Thousand Persons)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Romania, of which:	22,563	22,542.	22,520	22,492	22,442	22,402	22,360	22,300	22,260	22,236	22,202
Rural	9,744	9,758	9,749	9,737	9,733	9,739	9,724	9,715	9,698	9,709	9,690
Share of the rural (%)	43.2	43.3	43.3	43.39	43.4	43.5	43.5	43.6	43.6	43.7	43.7
South Muntenia, of which:	3,395	3,385	3,373	3,360	3,344	3,328	3,309	3,289	3,270	3,252	3,395
Rural	1,929	1,927	1,920	1,913	1,906	1,900	1,889	1,878	1,866	1,859	1,846
Share of the rural (%)	56.8	56.9	56.9	56.9	57.0	57.1	57.1	57.1	57.1	57.2	57.2

Source: Own determination based on Tempo Online, NIS, 2019 [25].

In the South Muntenia region, the rural population registered a decline of 4.4 % from 1,929 thousand persons in 2007 to 1,846 thousand persons in 2017.

Therefore, the decrease of the population living in the rural South Muntenia was higher than the decline of the rural population at the country level (Table 1) [11].

In the South Muntenia region lives only 14.5-15 % of the population of Romania, and the general trend is to decrease to 14.5 % in 2017.

With a share of 19 % in Romania's rural population, South Muntenia is on the top position. However, it has a general descending trend from 19.8 % in 2007 to 19 % in 2017 (Table 2).

This situation is due to the high number of communes, 519, and villages, 1,871 existing in this region [22].

Table 2. The share of South Muntenia Region's population and rural population in Romania's population and rural population, 2007-2017 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Share of the South Muntenia's population in Romania's population (%)	15.0	15.0	15.0	15.0	15.0	14.8	14.8	14.7	14.7	14.6	14.5
Share of the South Muntenia's rural populatiom in Romania's rural population (%)	19.8	19.7	19.7	19.6	19.6	19.5	19.4	19.3	19.2	19.1	19.0

Source: Own determination.

The number of births in South Muntenia region and their share in the births registered at the national level

The number of births in Romania decreased from 214,728 in 2007 to 205,835 in 2017, which means 4.2 % less than in the first year of the analysis. In the South Muntenia region it was noticed a similar decreasing trend from 30,735 in 2007 to 27,490 in 2017, reflecting -10.1 % less, that is much more than at the country level.

The share of births in the South Muntenia region in total births recorded in the country also declined from 14.3 % in 2007 to 13.3 % in 2017 (Table 3).

Table 3. The number of births in South Muntenia region and their share in Romania's number of Births, 2007-2017

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. of births in the South Muntenia	30,735	31,595	32,428	30,627	28,053	28,215	28,899	27,535	28,071	27,567	27,490
Share of the births of South Muntenia region in Romania's number of births (%)	14.3	14.2	14.6	14.4	14.3	14.0	13.4	13.5	13.6	13.5	13.3

Source: Own determination based on Tempo Online, NIS, 2019 [25].

The number of births in the rural space of Romania registered a decrease from 98,361 in 2007 to 92,793 in 2017, meaning by 6.7 % less than in the 1st year of the studied period.

If we analyze the situation of births in the rural area of the South Muntenia region, the situation looks to be more critical. In this part of the rural area of the country, the number of births declined by 8.6 %, from 17,592 in 2007 to 16,084 in 2017. Therefore, compared to the evolution at the country level, the decline of births in the rural space is much higher.

As a consequence, the share of the births of the rural South Muntenia in the number of births of rural Romania went down from 17.8 % in 2007 to 17.3 % in 2017 (Table 4) [3].

Table 4. The number of births in the rural South Muntenia region and their share in Romania's number of Births in the rural area, 2007-2017

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. of births in the rural South Muntenia	17,592	18,139	18,813	17,575	16,411	16,583	15,404	16,032	16,225	16,088	16,084
Share of the births of the rural South Muntenia region in Romania's number of births in the rural area (%)	17.8	18.0	18.7	18.7	18.3	17.9	16.9	17.4	17.5	17.4	17.3
Share of the births of the rural South Muntenia in total births in Romania (%)	8.1	8.1	8.4	8.3	8.4	8.3	7.8	7.9	7.8	7.9	7.8
Share of the births of the rural South Muntenia in total births in South Muntenia (%)	57.2	57.4	58.9	57.3	58.4	58.7	56.7	58.2	57.7	58.3	58.5

Source: Own determination based on Tempo Online, NIS, 2019 [11].

The number of births in the rural South Muntenia in the total number of births in Romania declined from 8.1 % in 2007 to 7.8 % in 2017.

But, if we analyze the situation within the South Muntenia region, we noticed that the share of the births in the rural space is over 50 %, more exactly registered a slight increase from 57.2 % in 2007 to 58.5 % in 2017. Therefore, in the rural area the births are more numerous than in the ruban area of this region. Similar results were found in the year 2011 by [22].

The dynamics of the natality rate in the South Muntenia and in Romania

As a consequence of the decreasing trend in the number of births, the natality rate in Romania has also decline from 9.5 per 1,000 inhabitants in 2007 to 9.3 in 2017. But, in 2011, it recorded the lowest level, just 8.7 per

1,000 persons while in the year 2009, it was registered the highest natality rate, 9.9%.

In the rural Romania, the natality rate is higher than the average natality at the national level. But, both at the national and regional level, natality recorded a general decreasing trend.

Natality rate in the South Muntenia region is smaller than at the national level. It also declined from 9.1 per 1,000 inhabitants in 2007 to 8.5 in 2017.

In the South Muntenia zone, it was noticed that the natality rate in the rural space is a little higher than the average natality in the region. But, the general trend is a descending one from 9.1 per 1,000 persons in 2007 to 8.7 % in 2017 (Table 5).

Table 5. The dynamics of the natality rate in Romania and in the South Muntenia region, 2007-2017 (Number of births/1,000 inhabitants)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Natality rate, Romania (%)	9.5	9.8	9.9	9.4	8.7	9.0	9.6	9.1	9.3	9.1	9.3
Natality rate in the rural Romania (%)	10.1	10.3	10.3	9.7	9.2	9.5	10.0	9.5	9.5	9.5	9.6
Natality rate in the South Muntenia (%)	9.1	9.3	9.6	9.1	8.4	8.5	8.7	8.4	8.6	8.5	8.5
Natality rate in the rural South Muntenia (%)	9.1	9.4	9.8	9.2	8.6	8.7	8.7	8.5	8.7	8.7	8.7

Source: Tempo Online, NIS, 2019 [11].

The low natality in the South Munetnia Region is explained by the population aging and low fertility rate, which have determined a higher share of the older population and a reduction of the young population. The population younger than 25 years represents about 27 %, while the people between 25-64 represents about 56 % and the people older than 65 accounts for about 17 % [22].

The dynamics of the deaths in the South Muntenia and in Romania

The number of deaths in Romania followed a general increasing trend, from 251,965 in 2007 to 261,3745 in 2017, meaning + 3.88 %.

In the South Muntenia region, the number of deaths has also increased but by 3.23 % from 42,288 in 2007 to 43,656 in 2017.

The share of the deaths registered in the South Muntenia region in the total deaths in the country looked to remain at the same level 16.7 % in the analyzed interval.(Table 6).

Table 6. The number of deaths in South Muntenia region and their share in Romania's number of Deaths, 2007-2017

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. of deaths in the South Muntenia	42,288	42,917	43,620	43,588	42,711	43,246	43,028	42,669	43,409	43,374	43,656
Share of the deaths of South Muntenia region in Romania's number of deaths (%)	16.7	16.9	16.9	16.8	16.9	16.9	16.8	16.7	16.5	16.8	16.7

Source: Own determination based on Tempo Online, NIS, 2019 [25].

In 2017, the number of deaths in the rural Romania was 137,446 compared to 137,403 in 2007 (+0.03%).

This led to a lower weight of deaths in the rural Romania in the total deaths in the country, more exactly 52.5% in comparison with 54.1 % in 2007.

The number of deaths in the rural South Muntenia declined a little from 29,398 in 2007 to 29,348 in 2017 (-0.2 %), which is of course a positive situation.

The share of the deaths in the rural South Muntenia in Romania's number of deaths in the rural areas remained relatively constant in 2017 compared to 2007 at the level 9f 21.3 %. However, in 2012, it was recorded the highest share, 21.6 %, and in 2015, the lowest level, 21.1 %.

The weight of the deaths in the rural area of the South Muntenia in the total deaths in the South Muntenia region (%) is unbelievable high, over 67 %.

But, the only positive aspect is that in 2017, it level was 67.6 % instead of 69.5 % in 2007. Also, the year 2014, it was registered the lowest share, 68 % (Table 7).

Table 7. The number of deaths in the rural South Muntenia and its share in Romania's number of deaths, 2007-2017

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. of deaths in the rural South Muntenia	29,398	29,790	31,122	30,264	29,541	29,891	28,721	29,044	29,397	29,017	29,348
Share of the deaths in the rural South Muntenia in Romania's number of deaths in the rural areas (%)	21.3	21.4	21.3	21.2	21.5	21.6	21.4	21.3	21.1	21.5	21.3
Share of the deaths in the rural area of the South Muntenia in the total deaths in the South Muntenia region (%)	69.5	69.4	69.0	69.4	69.1	69.1	68.3	68.0	67.7	66.8	67.6

Source: Own determination based on Tempo Online, NIS, 2019 [25].

The dynamics of the mortality rate in the South Muntenia region and in Romania

The mortality rate registered a slight decline from 9.5 % per 1,000 inhabitants in 2007 to 9.3 in 2017 at the level of Romania. In the rural areas of the country, the mortality rate is much higher than the death rate at the national level. But, it was noticed a slight decline of the mortality rate in the rural space from 10.1 per 1,000 inhabitants in 2007 to 9.6 in the year 2017.

In the South Muntenia, the death rate is a little lower compared to the death rate at the country level, and recorded a general decreasing trend from 9.1 deaths per 1,000 inhabitants in 2007 to 8.5 in the year 2017.

The death rate in the rural South Muntenia si a little bit higher than the death rate in this region. However, since 2007, it started to decline a little from 9.1 per 1,000 inhabitants to 8.7 in 2017 (Table 8).

Table 8. The dynamics of the mortality rate in Romania and in the South Muntenia region, 2007-2017 (Number of deaths/1,000 inhabitants)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mortality rate, Romania (%)	9.5	9.8	9.9	9.4	8.7	9.0	9.6	9.1	9.3	9.1	9.3
Mortality rate in the rural Romania (%)	10.1	10.3	10.3	9.7	9.2	9.5	10.0	9.5	9.5	9.5	9.6
Mortality rate in the South Muntenia (%)	9.1	9.3	9.6	9.1	8.4	8.5	8.7	8.4	8.6	8.5	8.5
Mortality rate in the rural South Muntenia (%)	9.1	9.4	9.8	9.2	8.6	8.7	8.7	8.5	8.7	8.7	8.7

Source: Tempo Online, NIS, 2019 [25].

The dynamics of the natural change of the population in the South Muntenia and in Romania.

Table 9. The dynamics of the natural population gain in Romania and in the South Muntenia region, 2007-2017 (Number of persons)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Natural gain, Romania	-37,237	-31,302	-34,825	-47,524	-55,197	-54,435	-35,534	-53,103	-56,791	-54,316	-55,910
Natural gain in the rural Romania	-39,042	-38,368	-40,521	-47,743	-47,216	-45,199	-37,239	-44,140	-46,656	-43,135	-44,653
Natural gain in the South Muntenia	-11,553	-11,322	-11,192	-12,961	-14,658	-15,031	-13,129	-15,134	-15,338	-15,807	-16,161
Natural gain in the rural South Muntenia	-11,806	-11,651	-11,309	-12,689	-13,130	-13,309	-12,317	-13,012	-13,172	-12,929	-13,264

Source: Tempo Online, NIS, 2019 [25].

The dynamics of the births and deaths influenced the natural gain, which had a negative value both at the level of Romania, in the rural Romania, in the South Muntenia and in the rural South Muntenia.

In the analyzed period, at the country level, the natural deficit of the population increased from -37,237 in the year 2007 to -55,910 in the year 2017. In the rural Romania, the negative level of the natural change is much higher than at the national level and also registered an increasing trend from -39,042 in 2007 to -44,653 in 2017.

In the South Muntenia, the natural change of the population is also negative and it also registered an increasing trend from -11,553 in 2007 to -16,161 in 2017.

In the rural South Muntenia, the negative natural change of the population has also raised from -11,806 in 2007 to -13,264 in 2017 (Table 9).

Dynamics of the poverty and social exclusion risk in Romania and the South Muntenia region (AROPE)

The poverty and social exclusion risk at the level of Romania ranged between 47 % in 2007 and 35.7 % in 2017, reflecting a decreasing trend which is a social positive aspect.

However, if we look at the data registered in the South Muntenia region, we may easily notice that in this part of Romania, the risk of poverty and social exclusion has higher levels compared to the average situation at the national level in the analyzed period. But, the positive aspect is that the level of the risk registered a descending trend from 52 % in 2007 to 40.9 % in 2017 (Table 10).

Table 10. The evolution of the poverty and social exclusion risk in Romania and the South Muntenia region in the period 2007-2017 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Romania	47	44.2	43	41.5	40.9	43.2	41.9	40.3	37.4	38.8	35.7
South Muntenia	52	46	47.6	42.8	43.5	45.5	42	41.7	43.5	41.2	40.9

Source: Tempo Online, NIS, 2019 [25].

In 2016, 23 % of the EU population was at risk of poverty or social exclusion, 17.3 % was at risk of poverty, 10.5 % of the population aged between 0-59 years lived in households with very low work intensity and 7.5 % of the population was seriously deprived from a material point of view.

According to Eurostat, On the top position in the EU regarding the highest poverty and social exclusion risk is Bulgaria (38.9 % of the total population) and then Romania comes on the 2nd position with 35.7 % in the years 2016-2017.On the 3rd position was Greece (34.8 %). Therefore, in 2017, about 33 % of the population was at risk of poverty or social exclusion in this three EU Member States [7].

People at risk of poverty includes both children and adults as shown in Table 11. Looking at the data we may easily notice that it is a large difference between the children risk of poverty and the adults risk of poverty. In the EU, Romania, Hungary and Slovakia have the largest difference between the rates of poverty risk for children and the total population.

Table 11. People at risk of poverty or social exclusion, by age group, Romania compared to the EU average, Bulgaria and Greece, 2017 (% of the population)

	Total	Children 0-17 years	Adults 18-64 years	Adults 65 and over
EU average	22.4	24.9	23.0	18.2
Bulgaria	38.9	41.6	34.8	49.8
Romania	35.7	41.7	34.6	33.2
Greece	34.8	36.2	38.6	22.8

Source: [7].

The children living in a household at risk of poverty and social exclusion have the highest percentage in Bulgaria (41.6 %) and Romania (41.7 %). This situation is determined by the

lack of jobs for their parents taking into account their low education level or accepting jobs which are paid at the minimum salary in the economy, also by the structure of the family these children belong to, by the efficiency of the measures taken by Government to support this category of people and by the migration of the parents of these children.

The old people is affected by the risk of poverty or the social exclusion due to the low level of the pensions, the gap of pension related to age and gender, in general women being much more affected than men [7].

In Romania there are also persons whose disposable income is below the national threshold of poverty risk. But in this situation, after the social transfer, there are important percentages of the population in many EU countries not only in Romania as mentioned by Eurostat: "Romania (23.6 %), Bulgaria (23.4 %), Lithuania (22.9 %), Latvia (22.1 %), Spain (21.6 %), Estonia (21.0 %), Italy (20.3 %), Greece (20.2 %) and Croatia (20.0 %)" [7].

A high material deprivation rate characterizes the old people over 65 living in the conditions which are highly affected by the lack of resources. From this point of view, Greece and Bulgaria have the highest rate: 21.1 % and respectively 30.0 %. Romania comes on the lower position taking into account that its rate fell by -4.1 pp in 2017 compared to 2016.

But, despite that the risk of poverty or social exclusion decreases in Romania, it is still high mainly among young people. The EU Commission considers that Romania has still a high level of poverty or social exclusion and also the highest income inequality. In the rural area the situation is the most critical, because here there many social problems regarding living and unemployment. The rural areas of Romania have the highest number of persons who live in low quality houses and consume more than 40% of their income [4].

Taking into account the situation of the negative population change (Y) and the high risk of poverty or social exclusion (X) and using regression between the two variable in order to identify it there is any dependence and correlation, we found that there is a positive correlation, r = 0.718 between these two indicators and that 51.59 % of the variation of the population negative change is determined by the variation of the risk of poverty or social exclusion (R^2)= 0.515.

The regression formula is:

$$Y= 2{,}263.065\ X\ -140{,}307$$

showing that if the risk of poverty or social exclusion (X) will grow by one unit, the decrease of the population change will increase by 2,263.065.

Therefore, the poverty and social exclusion is one of the factors with a high influence on the level of natural demographic indicators such as: births, deaths, natality, mortality and natural change.

CONCLUSIONS

Romania's population has a general decreasing trend due the negative population change, caused by low number of births, high number of deaths, lower natality rate and higher mortality rate and also by the high migration rate.

In the rural areas of Romania live about 44% of the population, characterized by aging, low training level, and dealing mainly with agriculture which assure a low income per family.

South Muntenia region registered a similar decreasing trend of the population like at the national level. In 2017, in this region were 3,252 thousand people by 4.3 less than in 2007.

The percentage of decline of the South Muntenia's population is higher than at the national level.

A number of 1,846 thousand persons represented the rural population of the South Muntenia region in 2017, being by 4.4 % less than in 2007. In the rural space of the region the percentage of decrease of the population is higher than in the rural Romania.

The rural population of the South Muntenia represents 14.5 of Romania's population and 19 % of Romania's rural population.

The number of births in Romania declined by 4.2, accounting for 205 thousands in 2017. In the South Muntenia, the number of births also decline but much more, - 10 %, reaching 27,490 in 2017. As a result 13.3 % of the number of births in Romania are achieved in South Muntenia region.

In the rural Romania the number of births registered a higher decrease (-6.7 %), while in the rural South Muntenia the decline was higher (-8.6 %).

In rural Romania, the natality rate is higher than the national average. In the rural areas was noticed the same decreasing trend like at the national level.

In the South Muntenia, the natality rate is smaller than at the national level and accounted for 8.5 per 1,000 inhabitants in 2017. In the rural South Muntenia, the natality rate is higher than the one at the region level, and in 2017 it was 8.7 per 1,000 inhabitants.

Due to the increased deaths in Romania, the mortality rate accounted for 9.3 % in 2017. In the South Muntenia, the mortality rate was 8.5 per 1,000 inhabitants.

In the rural Romania the mortality rate is higher than the national average, and in the south Muntenia the rural mortality rate is 67 %, one of the highest of the total number of the population living in the rural space of this region.

Due to the evolution of natality and mortality, in the analyzed period, Romania registered a higher and higher decrease of the population, which was also caused by migration. In 2017, the natural population change in Romania accounted for -55,910 and in the rural Romania for -44,653.

In case of the South Muntenia region, the natural change of the population was also negative and increased to -16,161, and in the rural areas it reached -13,264 in 2017.

The decline of the natural demographic indictors was caused among other factors by the poverty and social exclusion. Romania comes on the 2nd position in the EU, after Bulgaria for the highest risk of poverty or social exclusion. But, a positive aspect is that there is a general decreasing trend so that in 2017, this indicator was 35.7 %.

In the South Muntenia region, the risk of poverty and social exclusion is much higher than the average at the national level. However, it declined from 52 % in 2007 to 40.9 % in 2017, which is a positive aspect. The most affected categories by poverty and social exclusion are children below 17 years and the people older than 64 years. The last ones have low pension and the difference among various age categories and gender are substantial.

This research proved that between the negative natural change of the population and the risk of poverty and social exclusion is a moderate and positive correlation, and that 51.59 % of the variation of the population negative change is determined by the variation of the risk of poverty or social exclusion.

In conclusion, the improvement of the natural demographic indicators of the population in the sense to increase the number of births, natality rate and the natural change and to decrease the number of deaths and mortality rate requires to reduce the risk of poverty and social exclusion of the population and mainly in the rural areas.

The Romanian Government has to establish an efficient strategy to eliminate this social discrepancies and assure a better living standard both for the people living in the urban and the rural areas.

REFERENCES

[1]Blaug, M., Popescu, A.,Pârvuţoiu, I., 1992, Teoria economica in retrospectiva (Economic Theory in retrospect), Editura Didactică şi Pedagogică (Didactic and Pedagogic Publishing House), Bucharest, pp.38.

[2]Condei, R., Popescu, A., Balan, A., Tudor, V., 2015, Aspects of employment in agriculture in the main development regions of Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 15, Issue 2, 2015, 67-73.

[3]Cucu, M.A., Cristea, C., Calomfirescu, C., Scorțan, E., Matei, E., Partin, A., Cirtog, C., Domnariu, C., Filip, I., Bălăşan, L., Galan, A., Ursu, C., Rădulescu, S., Brînduşe, L., Georgescu, D., 2016, National Report regarding The health status of Romania's population 2016 (Raport Național privind Starea de Sănătate a Populației României 2016, http://insp.gov.ro/sites/cnepss/rapoarte/, Accessed on April 10, 2019.

[4]European Commission: Income inequality up in Romania, poverty and social exclusion at high level, 2017, Business Review, 23 Feb.2017, http://business-review.eu/news/european-commission-income-inequality-up-in-romania-poverty-and-social-exclusion-at-high-level-131147, Accessed on April 10, 2019.

[5]Eurostat Statistics Explained, Glossary: Natural population change, https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Natural_population_change, Accessed on April 10, 2019.

[6]Eurostat Statistics Explained, 2017, Population and population change statistics, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Population_and_population_change_statistics#Population_change_at_a_national_level, Accessed on April 10, 2019

[7]Eurostat Statistics Explained, 2019, People at risk of poverty or social exclusion, https://ec.europa.eu/eurostat/statistics-explained/index.php/People_at_risk_of_poverty_or_social_exclusion, Accessed on April 10, 2019.

[8]Grigoras, M.A., Popescu, A., Holeab, C., Chedea, V., Merce, E., 2007, Bridging the innovation gap and the management of interdisciplinary project for sustainable development, XXXVII Annual Meeting of European Society for New Methods in Agricultural Research, ESNA, 10-14.09.

[9]National Institute of Statistics, 2012, Evolution of fertility and natality in Romania (Evolutia fertilitatii si natalitatii in Romania), http://www.insse.ro/cms/files/publicatii/Evolutia%20natalitatii%20si%20fertilitatii%20in%20Romania_n.pdf, Accessed on April 10, 2019.

[10]Natural population growth, Wikipedia, https://en.wikipedia.org/wiki/Natural_population_growth,Accessed on April 10, 2019.

[11]Petre, I.D., 2018, Aspects regarding the living standard of the rural population in the South Muntenia region of development, Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.18(2)

[12]Popescu, A, 2012, Research regarding oil seeds crops development in Romania in the EU context, Economics of Agriculture, Vol.59(1):129-137.

[13]Popescu, A., 2013, Considerations on the Rural Population as a Resource of Labor Force in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.13, Issue 3/2013, p.229-236.

[14]Popescu, A., 2015, Analysis of the evolution and distribution of maize cultivated area and production in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.15, Issue 3/2015, p. 261-264.

[15]Popescu, A., 2015, Research on labour productivity in Romania's agriculture, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 15, Issue 2, 2015, 271-280

[16]Popescu, A., 2015, Research on the distribution and concentration of the farms cultivating maize for grains in Romania using the Gini Coefficient, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.15, Issue 3/2015, p. 253-260

[17]Popescu, A., 2017, Maize culture- An intensive or extensive production system in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development,Vol.17(1)2017, p.351-356

[18]Popescu, A., 2018, Maize and Wheat - Top agricultural products produced, exported and imported by Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.18, Issue 3/2018, p.339-352.

[19]Popescu, A., Condei, R., 2015, Research on Romania's employment in agriculture and its position in the European Union, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 15, Issue 2, 2015.

[20]Popescu, A., Grigoras, M.A., 2011, Research concerning Rural versus Urban Population – Present and Prospect, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.11, Issue 2/2011, p.157-161.

[21]Popescu, A., Toma, A., D., Stoian, E., 2018, Demographic and economic changes characterizing the rural population in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.18, Issue 2/2018, p.333-346.

[22]Socio-economic analysis of the South Munetnia Region (Analiza socio-economica a Regiunii Sud Muntenia), 2013, https://www.adrmuntenia.ro/.../analizasocecpdr2014202draft3revizuit110213_am_encrypted.pdf, Accessed on April 10, 2019.

[23]State of Health in the EU, Romania, Profilul sanatatii in 2017, https://ec.europa.eu/health/sites/health/files/state/docs/chp_romania_romanian.pdf, Accessed on April 10, 2019.

[24]Surcel, V., 2018, Decimates by the decrease of the natality (Decimați prin scăderea natalității), Cotidianul, https://www.cotidianul.ro/decimati-prin-scaderea-natalitatii/, Accessed on 10 April, 2019

[25]Tempo Online, NIS, 2019, www.insse.ro, Accessed on April 10, 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE DYNAMICS OF THE NUMBER OF EMPLOYEES, AVERAGE MONTHLY SALARY, INCOME PER HOUSEHOLD AND PENSIONS IN ROMANIA AND THE SOUTH MUNTENIA REGION

Ionut Daniel PETRE

University of Agricultural Sciences and Veterinary Medicine, Bucharest, 59 Marasti, District 1, 011464, Bucharest, Romania, +40213182564, Fax: +40213182888, Email: ptr_ionutdaniel@yahoo.co.uk

Corresponding author: ptr_ionutdaniel@yahoo.co.uk

Abstract

The paper aimed to analyze the number of employees, average monthly wage, average income per household and pension both in Romania and in the South Muntenia region in the period 2007-2017. Fixed indices reflected the evolution of these indicators and the comparisons pointed out the differences among various categories: employees, agriculturists and pensioners. The results proved that at the national level the average number of employees increased by 1.2 %, but in the South Muntenia it declined by 4.1 %. In agriculture, forestry and fishing, this number of employees raised by 30.4 % at the national level and by only 9.8 % in South Muntenia, where there were employed about 19.7 % persons in 2017. The average nominal monthly salary increased by more than 75 % both at the national and regional level, but in the South Muntenia, it is lower. In agriculture, forestry and fishing, the average nominal salary has also increased, but at the regional level is smaller compared tot the country level. Per household, the total average monthly income had a higher growth rate for agriculturists, then for pensioners and finally for employees. But, there is a huge gap of salary level, the highest total average monthly income per household belonging to the employees, followed by agriculturists and pensioners. In 2017, the income per household accounted for Lei 3,392average in the country and Lei 3,201 average in South Muntenia. In this region, the highest income per household is earned by employees, followed by pensioners, and then by agriculturists. The pensions increased more than 2.5 times, but the agriculturists' pension is by 50 % smaller than the average pension in the country. Therefore, in Romania both the wage and pension level are the smallest in the EU. This the reason way the labour market in not balanced, migration is intensified and poverty is very high in many regions and rural areas of the country. The Government has to revise and improve the salary and pension system to recompense both the employees and pensioners for their work for society and prosperity of the country.

Key words*: *average number of employees, average nominal salary, average income per household, pension*, *South Muntenia region, Romania

INTRODUCTION

"An employee must always live based on his work, and the salary has to be enough to sustain his and his family existence" affirmed Adam Smith in his book "An Inquiry into the Nature and Causes of The Wealth of Nations"(1776) [24].

David Ricardo considered that "the price of labour force is given by the amount of necessary work for producing a good". Karl Marx, in his book on "Capital"(1867), Vol. II, about the "Theories of Surplus Value"(1862), sustained that "between labour force, labour productivity and salary is a close connection" as sustained. More than this, he added that "the price of labour force is determined by the balanced ratio between demand and offer"[2].

Alfred Marshall pointed out the importance of labour force's education and training which could be considered "an investment in human capital with a deep influence on the labour market and on the economic development and earnings"[6].

Later, John Maynard Keynes in his book "The General Theory of Employment, Interest and Money (1936), sustained that "money salaries depend on the price growth and the offer of labour force is directly linked to the level of the nominal salary" as mentioned Mark Blaug in his "Economic Theory in Retrospect" [2, 8].

In the salary theory, there are approached many types of salaries. First, "nominal salary" is the amount of money received by an employee for his/her work. "Real salary" is the amount of goods which could be purchased with the nominal salary. Therefore, real salary depends on the level of nominal salary, being directly proportionate with nominal salary. But, also, real salary is connected to price level with which it has a relationship of reverse proportionality. Also, we may discuss about "net salary" which is what an employee receives from his/her salary after the subtraction of various taxes and contributions. Also, another category of salary is "minimum salary" which is legally fixed to guarantee a minimum decent subsistence income for the category of deprived employees.

The term of "salary" is used only for the persons who are employed based on an individual work contract.

In Romania, the number of employees declined during the last three decades from over 8 million in 1990. However, in February 2018, the number of employees increased and reached 4.9 million for the 1st time due to the employment in processing industry, trade, health, social assistance, hotels and restaurants and information technology and communications. More than this, in 2018, in Romania there were 5,028,200 pensioners [9].

Comparing the two figures, one can easily notice the non corresponding ratio between the number of pensioners and the number of employees, and this situation was determined by the decreased number of the active population due to ageing and migration flows to the Western countries, and has a negative impact on the sustainability of social security systems [12, 22].

The pension level in Romania is a very modest one and for many pensioners the only income source. Average pension is an important social indicator of living standard of the old population, and a low pension reflects the level of poverty.

More than 27 % of the EU population over 60 years represent people at risk of poverty or social exclusion, and in Romania comes on the 2nd position after Bulgaria regarding this aspect.

This means that the pension public budget is not enough to assure a higher pension. The explain should be found in the structure of the labour force market and the number of pensioners, because the number of the employees determines the volume of the pension budget by means of their social contributions [1].

The rural areas are characterized by a high number of people living there, representing about 44 % of Romania's number of inhabitants [21].

Most of the rural inhabitants are dealing with agriculture and just a few with forestry and fishing or other activities. The income coming from agriculture is the smallest one among other types of incomes, and more than this the rural population is aging, has a low education level and is not able to work the whole land that it owns or to raise more animals, therefore the productivity is low, and production is in most of cases used for the family consumption as specific for subsistence family farms or if the family has an income its level is very small. Many pensioners live in the rural areas and their pensions are very small [4, 11, 14, 16, 20].

These aspects of the rural areas regarding the economic state and social problems affects the sustainable economic development of the rural communities. The monographs resulting from the multidisciplinary projects destined to study the rural space and communities pointed out the need of investments in local infrastructure, diversification of the activities valorising the local material, natural and human resources [7].

In this context, the paper aimed to analyze the evolution of the number of employees, average monthly salary, nominal income per household and pension level in Romania and also in the South Muntenia region, considered one of "the poles of poverty" in the country. The reference period of the study was 2007-2017 and the empirical data were collected from the National Institute of Statistics.

MATERIALS AND METHODS

Romania is situated in the South Eastern part of Europe, being the 12th country based on its surface (238,397 square kilometres) and on the 7th position for its population (19.5 million inhabitants). In 2017, for its nominal GDP, Romania ranked the 47th position in the world and had the highest economic growth rate (7 %) among the EU countries. Despite that Romania's GDP share in the EU average GDP increased from 41 % in 2007 to 63 % in 2017, the economic development level is still far away from the one in the most developed EU countries [26].

In 2019, Romania's GDP (PPP) accounted for USD 547 Billion, meaning USD 28,189 GDP per capita (PPP) [5].

Compared to other EU countries, Romania has one of the smallest average monthly salary, whose level was Euro 540 in 2016. In December 2016, the average gross nominal earnings accounted for Lei 3,257 and the average net nominal earnings for Lei 2,354 [10].

The South Muntenia region is one of the development regions situated in the South part of Romania, and comes on the 3rd position based on its surface (34,453 square kilometers, 14.5 %). From an economic point of view, the region is among the most deprived ones in Romania, considered a "pole of poverty"as its GDP is below 75 % of the EU average GDP [23].

The region is characterized by the dominance of rural settlements, the degree of rurality being 58.6 %. The main activity which is carried out the rural localities is agriculture. The region is favoured for cereals (wheat, rye, maize, barley), oil crops (sun flower, soya bean and rape), leguminous crops (peas and bean), and forages. Agricultural production are high in some parts of the region but also low in the deprived areas due to soil quality, drought, aridity. Beside de high number of agriculturists running their activity in small farms, there are also other more industrialized activities producing cars, chemicals, fridges and other house goods and food [13, 15, 17, 18, 19, 23].

Employment in Romania's primary sector: agriculture, forestry and fishing represents about 30 % of the total employment in the economy, very high compared to 5 % the EU average. In Romanian agriculture, 11 % are employees, 88.7 % are unemployed people, 69 % are full time and 31 % part time. The EU average of employees in agriculture is 33 %.

In the South Muntenia region, the occupancy rate is decreasing like at the national level, being 55.4%. In the agriculture of this region are working more than 1.2 million persons.

The age of farmers younger than 35 is below 10 % in Romania, of the ones between 35 and 55 years is about 25 %, and the share of the farmers over 55 % is 65 %. Therefore, farmers ageing will be a big problem for the future as the young generation prefer going to the cities or migrating to other countries.

Productivity is still low in agriculture, due to the small farm size, low technical endowment, old technologies and low training level. The level of productivity in Romania's agriculture is 29 % of the EU average, more exactly GVA at basic price, Euro 4,329 per AWU [3, 4, 7, 16].

The living standard of the population is low, taking into account the GDP per capita, living conditions, earnings and average wage [11].

In order to set this study case, the empirical data were used form the data base of the National Institute of Statistics for the period 2007-2017.

The main analyzed indicators have been: the average number of employees, the average number of employees in agriculture, forestry and fishing, the average nominal monthly salary, the total average monthly income per household, and the average monthly pension.

All these indicators were analyzed at the national level and also at the regional level, having as example the South Muntenia region of development.

The methodological background included various well known procedures and methods utilized for the dynamic analysis and structural dynamics, and comparison of the chronological series of data between various indicators.

The results have been commented and finally the main ideas resulting from this study have been included in the conclusions.

RESULTS AND DISCUSSIONS

The dynamics of the average number of employees in Romania and the South Muntenia Region

In Romania the average number of employees increased by 1.2 % from 4,885 thousand in 2007 to 4,946 thousand persons in 2017.

In the South Muntenia region, the number of employees declined by 4.1 % from 597,039 in 2007 to 573,033 in 2017.

This decrease is explained by the lack of labour force on the labour market, the low training level and skills as people to be employable and the migration to other countries looking for jobs well paid.

As a result, the share of the average number of employees of the South Muntenia region in Romania's average number of employees went down from 12.2 % in 2007 to 11.5 % in 2017 (Table 1).

Table 1. Dynamics of the average number of employees in Romania and the South Muntenia region in the period 2007-2017 (Thousands)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Romania	4,885	5,046	4,774	4,376	4,349	4,442	4,443	4,508	4,611	4,759	4,946
South Muntenia	597	601	575	519	514	523	528	531	541	548	573
Share of No. of employees in South Muntenia in Romania's No.of employees (%)	12.2	11.9	12.0	11.8	11.8	11.7	11.8	11.7	11.7	11.5	11.5

Source: Own determination based on Tempo Online, NIS, 2019 [25].

The dynamics of the average number of employees in agriculture, forestry and fishing

Despite that Romania has a huge number of farms, about 3.4 million, just a few number of people is employed in agriculture. Even in other activities like forestry and fishing it is a small number of employees.

In the analyzed period, at the national level, the average number of employees in the sector of agriculture, forestry and fishing increased by 30.4 % from 93,302 in 2007 to 121,720 in 2017.

In the South Muntenia region, it was also registered an increased number of employees in these three sectors of activity, more exactly 9.8 % from 21,838 in 2007 to 23,995 in 2017.

As a consequence, the share of the average number of the employees in the South Muntenia's agriculture, forestry and fishing in Romania's average number of employees in these sectors of activity declined from 23.4 % in 2007 to 19.7 % in 2017 (Table 2).

Table 2. Dynamics of the average number of the employees in agriculture, forestry and fishing in Romania and the South Muntenia region

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Romania	93,302	104,819	110,079	95,185	97,630	103,663	103,813	107,728	112,699	117,046	121,720
South Muntenia	21,838	21,768	23,633	19,924	19,766	21,623	20,857	21,332	22.745	23,698	23,995
Share of No. of employees in South Muntenia in Romania's No.of employees (%)	23.4	20.7	21.4	20.9	20.2	20.8	20.0	19.8	20.1	20.2	19.7

Source: Own determination based on Tempo Online, NIS, 2019 [25].

The dynamics of the average nominal monthly salary

In the last decade the average nominal monthly salary increased in Romania and in

its regions of development grace to the economic growth and progress in the labour productivity.

At the national level, the average nominal monthly salary increased by 78.6 % from Lei 1,309 in 2007 to Lei 2,338 in 2017.

An important growth of 74.5 % was noticed in the South Muntenia region. In 2017, the average nominal monthly salary in the region accounted for Lei 2,130 compared to Lei 1,220.

However, the data show that the level of the average salary is lower in the South Muntenia region compared to the national level (Table 3).

Table 3. Dynamics of the average nominal monthly salary in Romania and South Muntenia (Lei/month)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Romania	1,309	1,361	1.391	1,444	1,507	1,579	1,697	1,859	2.046	2,338
South Muntenia	1,220	1,294	1,303	1,321	1,394	1,463	1,582	1,798	1,852	2,130
Share of the average monthly salary in South Muntenia in Romania's average monthly salary (%)	93.2	95.0	93.6	91.4	92.5	92.6	93.2	91.8	90.5	91.1

Source: Own determination based on Tempo Online, NIS,2019 [25]

The dynamics of the average nominal monthly salary in agriculture, forestry and fishing

In Romania, the average nominal monthly salary in agriculture, forestry and fishing increased 2.03 times from Lei 914 in the year 2008 to Lei 1,858 in 2017.

However, its level is much smaller compared to the average nominal monthly salary in the economy. In 2008, the difference was Lei 395 and in 2017 it was Lei 480. Therefore, the salary in agriculture, forestry and fishing represents 69.8 % in 2008 and 74.4 % in 2017 of the average nominal monthly salary in the economy.

In the South Muntenia region, the average nominal monthly salary also increased 2.04 times from Lei 902 in 2008 to Lei 1,845 in 2017. In this region, the level of this salary is also lower than the average monthly salary in the economy of South Muntenia. In 2017, an employee working in agriculture, forestry and fishing earned only 86.6 % of the average salary in the South Muntenia region compared to 73.9 % in 2007, which is a positive aspect, but not enough to cover the gap.

The share of the average nominal monthly salary in agriculture, forestry and fishing of the South Muntenia in Romania's average nominal monthly salary coming from these activities increased from 98.6 % in 2008 to 99.3 % in 2017. But, in the year 2012 and 2014 it was even higher than Romania's average nominal monthly salary by 0.3 % and respectively 2.7 % (Table 4).

Table 4. Dynamics of the average nominal monthly salary in agriculture, forestry and fishing in Romania and South Muntenia (Lei/month)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Romania	914	1,007	1,024	1,044	1,093	1,179	1,270	1,371	1,621	1,858
South Muntenia	902	971	963	1,014	1,097	1,122	1,305	1,318	1,549	1,845
Share of the average monthly salary in South Muntenia in Romania's average monthly salary (%)	98.6	96.4	94.0	97.1	100.3	95.1	102.7	96.1	95.5	99.3

Source: Own determination based on Tempo Online, NIS,2019 [25].

The dynamics of the total average monthly income per household in Romania

In Romania, in the analyzed interval, the total average monthly income per household

increased 2 times from Lei 1,686.7 in 2007 to Lei 3,391.6 in 2017. In case of the employees, the average monthly income per household increased by 36.3 % from Lei 2,347.1 in 2007 to Lei 3,200.8 in 2017. In case of the agriculturists, in 2017, the average monthly income per household was Lei 4,694.7 being 3.66 times higher than in 2007. The pensioners received an average monthly income 3.6 times higher in 2017 accounting for Lei 4,618 in comparison with Lei 1,274 per household in 2007 (Table 5).

Table 5. Dynamics of the total average monthly income per household in Romania (Lei/month)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Romania	1,686	2,132	2,316	2,304	2,417	2,475	2,559	2,501	2,687	2,945	3,392
-Employees' income	2,347	2,853	3,105	3,091	3,146	3,238	3,419	3,421	3,656	3,696	3,200
-Agriculturists' income	1,282	1,594	1,823	1,672	2,085	2,029	2,098	2,061	2.181	4,051	4,695
-Pensioners' income	1,274	1,704	1,872	1,905	2,017	2,034	2,073	1,963	2,040	3,822	4,618

Source: Own determination based on Tempo Online, NIS,2019 [25].

One may easily notice from the data presented in Table 5, that the employees have the highest total average monthly income per household, agriculturists are coming on the second position and finally the pensioners have the lowest income.

The dynamics of the total average monthly income per household in the South Muntenia region

At the level of the South Muntenia region, the total average monthly income per household increased by 55.4 % in the studied period from Lei 2,059 in 2008 to Lei 3,201 in 2017. The employees' income declined by 3.4 % from Lei 3,332 in 2008 to Lei 3,220 in 2017. The agriculturists' income increased from Lei 1,534 in 2008 to Lei 2,181 in the year 2017, meaning + 42.1 %. The pensioners' income raised by 35.4 % in the analyzed interval from Lei 1,736 in 2008 to Lei 2,352 in 2017 (Table 6).

Table 6. Dynamics of the total average monthly income per household in the South Muntenia region (Lei/month)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
South Muntenia	ND	2,059	2,251	2,369	2,337	2,435	2,431	2,443	2,466	2,696	3,201
-Employees' income	ND	3,332	3,425	3,472	3,822	4,618	2,779	3,065	3,181	3,065	3,220
-Agriculturists' income	ND	1,534	2,044	1,878	1,951	2,203	2,005	1,919	1,890	1,994	2,181
-Pensioners' income	MD	1,736	1,865	2,027	2,038	2,057	2,046	1,974	1,988	2,102	2,352

Source: Own determination based on Tempo Online, NIS,2019 [25].

Like at the national level, in the South Muntenia region the total average monthly income per household was different among various categories of people. In this area, the employees are also on the top position with the highest level of income, but on the second position are the pensioners, followed by the agriculturists who come on the third place.

It is strange that in a region where the share of the population in the rural areas is 44 % and agriculture is the main activity producing income, the level of this income is the lowest one.

The share of the total average monthly income per household in the South Muntenia region in Romania's total average monthly income per household is presented in Table 7.

Table 7.The share of the total average monthly income per household in the South Muntenia region in Romania's total average monthly income per household (%)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
-Region's share	96.6	97.2	102.8	96.7	98.3	94.9	97.6	91.7	91.5	94.3
-Employees' share	57.3	59.4	102.9	97.4	99.4	97.4	100.1	94.9	94.3	98.3
-Agriculturists' share	96.1	112.1	112.3	93.5	108.5	95.5	93.0	86.6	92.5	82.7
-Pensioners' share	101.8	99.6	106.3	101.0	101.1	98.7	100.5	97.4	97.7	98.1

Source: Own determination.

The figures from Table 7 reflect that there are some differences between the total average monthly income per household in Romania and its level in the South Muntenia region. However, there are a few years in which in the South Muntenia region the level of this income was higher than the average income in the country. It is about the year 2010, when all the categories of people received a higher income than the national average. Also, it is about the years 2008, 2010, 2011, 2012 and 2014 for pensioners, the year 2009 and 2010 for agriculturists, and the years 2010 and 2014 for employees.

The dynamics of the average monthly pension in Romania and the South Muntenia region

The value of the average pension increased 2.57 times at the national level, 2.64 times for agriculturists in Romania, 2,62 times in the South Muntenia region and 2.66 times for the agriculturists from the South Muntenia, and this is a positive aspect.

But, the share of the agriculturists' pension in the average pension in Romania reflects that the agriculturists receive a pension by 50 % smaller than the average pension in the country.

In the South Muntenia region, the average pension is lower compared to the average national level.

But, the agriculturists in the South Muntenia region have a pension a little bit higher than the average pension of the agriculturists in Romania (Table 8).

Table 8. The dynamics of the average monthly pension in Romania and the South Muntenia region (Lei/month)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Average pension in Romania	399	593	711	739	773	778	809	845	886	931	1,02
Average pension of the agriculturists in Romania	159	253	300	309	311	313	327	342	361	381	421
Share of the agriculturists' pension in the average pension in Romania %	39.8	42.6	42.1	41.8	40.2	40.2	40.4	40.4	40.7	40.9	41.0
Average pension in the South Muntenia region	375	560	671	699	732	738	770	807	848	892	985
Average pension of the agriculturists in the South Muntenia	161	257	304	314	317	319	333	348	368	388	429
Share of the average pension of the agriculturists in South Muntenia %	42.9	45.8	45.3	44.9	43.3	43.2	43.2	43.1	43.4	43.5	43.5
Share of the average pension in the South Muntenia in the average pension in Romania %	93.9	94.4	94.3	94.5	94.7	94.8	95.1	95.5	95.7	95.8	96.0
Share of the agriculturists; average pension in the South Muntenia in the pension of the agriculturists in Romania %	101.2	101.5	101.3	101.6	101.9	101.9	101.8	101.7	101.9	101.8	101.9

Source: Own determination based on Tempo Online, NIS,2019 [25].

CONCLUSIONS

In Romania the average number of employees has slightly increased by 1.2 % while in the South Muntenia it declined by 4.1 %, which led to a lower share of the employees in the South Muntenia, 11.5 % in the total number of employees in the country. The causes are the lack of labour force, the low education level and migration.

The average number of employees in the sector of agriculture, forestry and fishing of Romania reached 121,172 in 2017, being by 30.4 % higher than in 2007. In the South Muntenia, their number accounted for 23,995 in 2017 representing by 9.8 % more than in the first year of the study. As a result, South Muntenia's employees dealing with agriculture represented 19.7 % of Romania's employees in this sector.

The average nominal monthly salary increased by at the national and regional level, more exactly by 78.6 % and 74.6%. But in the South Muntenia, the average salary is lower than at the national level, accounting for Lei 2,130.

The average nominal monthly salary in agriculture, forestry and fishing at the country

level and in the South Muntenia region two times in the analyzed interval, but its level in the region is smaller compared to its average level at the country level.

The total average monthly income per household increased in the country and also in the South Muntenia region. But taking into account various categories of beneficiaries, the income growth rate of the highest for agriculturists, followed by pensioners and finally by employees.

However, between these three categories of beneficiaries, the employees have the highest total average monthly income per household, followed by agriculturists and then by pensioners.

Per household, the total average monthly income by 55.4 % at the national level, accounting for Lei 3,392 in 2017, In the South Muntenia region it also increased, accounting for Lei, 3201, but in a different manner by category of beneficiaries: the employees earn the highest level of income, on the second position are the pensioners, and on the last position the agriculturists.

Regarding pensions, their level increased more than 2.5 times both at the national level, in South Muntenia and for agriculturists as well. But, the agriculturists' pension is 50 % smaller than the average pension in the country.

As a final conclusion, the wage and pension level in Romania are the smallest in the EU. A positive aspect is that in the analyzed period both the average nominal salary and pension raised, but not enough compared to other countries in the EU.

This is one of the reasons why many people, especially the young people leave the country going to offer their work in the Western countries for getting a better paid job.

The actual public system in Romania should be definitely improved in order to recompense in a correct way the retired persons for their work for society and prosperity of the country. More than this, the wage level should be also improved in order to be more attractive for the potential employable persons in various sectors of activity.

A special attention should be paid to the income of the employees in agriculture and also to the farmers whose efforts to carry out agricultural products and food for the domestic market to sustain the economy and life.

REFERENCES

[1]Bilbiie, I., 2013, How does the labour's market dynamic influence the level of the public pension in Romania in the actual economic context?, Theoretical and Applied Economics Vol. XX, No. 5(582), pp. 107-114.

[2]Blaug, M., Popescu, A.,Pârvuţoiu, I., 1992, Teoria economica in retrospectiva (Economic Theory in retrospect), Editura Didactică şi Pedagogică (Didactic and Pedagogic Publishing House), Bucharest, pp.358, 700.

[3]Burja, V., 2014, Some aspects of employment in Romania's agriculture in the European context, Annales Universitatis Apulensis Series Oeconomica, 16(1), 2014, 41-51.

[4]Condei, R., Popescu, A., Balan, A., Tudor, V., 2015, Aspects of employment in agriculture in the main development regions of Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 15, Issue 2, 2015, 67-73.

[5]Eurostat Statistics Explainedf, 2019, GDP per capita, consumption per capita and price level indices https://ec.europa.eu/eurostat/statistics-explained/index.php/GDP_per_capita,_consumption_per_capita_and_price_level_indices, Accessed on April 12, 2019.

[6]Groenewegen, P.D., 1991, Alfred Marshall's "Principles of Economic" 1890-1990, Quaderni di storia dell'economia politica, Vol. 9, No. 2/3, Vol. I, pp.59-87.

[7]Grigoras, M.A., Popescu, A., Holeab, C., Chedea, V., Merce, E., 2007, Bridging the innovation gap and the management of interdisciplinary project for sustainable development, XXXVII Annual Meeting of European Society for New Methods in Agricultural Research, ESNA, 10-14.09.

[8]Keynes, J.M., 1936, The General Theory of Employment, Interest and Money, https://cas2.umkc.edu/economics/people/facultypages/kregel/courses/econ645/winter2011/generaltheory.pdf, Accessed on April 12, 2019.

[9]Mihai, A., 2018, Historical Record: The number of employees in Romania is for the first time during the last 20 years 4.9 million (in Romanian), https://www.zf.ro/eveniment/record-istoric-numarul-de-salariati-din-romania-a-trecut-pentru-prima-data-de-20-de-ani-incoace-de-4-9-milioane-17161821, Accessed on April 12, 2019.

[10]National Institute of Statistics, Average Gross Earnings on Total economy were Lei 3,257 in

December 2016, Press Release 31/9 February 2017, http://www.insse.ro/cms/sites/default/files/com_presa/com_pdf/cs12e16.pdf, Accessed on April 12, 2019.
[11]Petre, I.D., 2018, Aspects regarding the living standard of the rural population in the South Muntenia region of development, Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.18(2)
[12]Pinzaru, C., 2015, Some Considerations of Population Dynamics and the Sustainability of Social Security System, Procedia - Social and Behavioral Sciences 183, 68 – 76.
[13]Popescu, A, 2012, Research regarding oil seeds crops development in Romania in the EU context, Economics of Agriculture, Vol.59(1):129-137.
[14]Popescu, A., 2013, Considerations on the Rural Population as a Resource of Labor Force in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.13, Issue 3/2013, p.229-236.
[15]Popescu, A., 2015, Analysis of the evolution and distribution of maize cultivated area and production in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.15, Issue 3/2015, p. 261-264.
[16]Popescu, A., 2015, Research on labor productivity in Romania's agriculture, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 15, Issue 2, 2015, 271-280
[17]Popescu, A., 2015, Research on the distribution and concentration of the farms cultivating maize for grains in Romania using the Gini Coefficient, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.15, Issue 3/2015, p. 253-260
[18]Popescu, A., 2017, Maize culture- An intensive or extensive production system in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development,Vol.17(1)2017, p.351-356
[19]Popescu, A., 2018, Maize and Wheat - Top agricultural products produced, exported and imported by Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.18, Issue 3/2018, p.339-352.
[20]Popescu, A., Condei, R., 2015, Research on Romania's employment in agriculture and its position in the European Union, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 15, Issue 2, 2015.
[21]Popescu, A., Grigoras, M.A., 2011, Research concerning Rural versus Urban Population – Present and Prospect, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.11, Issue 2/2011, p.157-161.
[22]Rubenstein, E. S., 2010-2011, The Economic Case for an Immigration Moratorium: Part 1, Vol.21, No.2, The Social Contract Press, https://www.thesocialcontract.com/artman2/publish/tsc_21_2/tsc_21_2_rubenstein_ecomomic_case.shtml, Accessed on April 12, 2019
[23]Socio-economic analysis of the South Muntenia Region (Analiza socio-economica a Regiunii Sud Muntenia), 2013, https://www.adrmuntenia.ro/.../analizasocecpdr2014202draft3revizuit110213_am_encrypted.pdf, Accessed on April 10, 2019.
[24]Smith, A., 1776, An Inquiry into the Nature and Causes of The Wealth of Nations, Cannan Ed., Vol.I., https://oll.libertyfund.org/titles/smith-an-inquiry-into-the-nature-and-causes-of-the-wealth-of-nations-cannan-ed-vol-1, Accessed on April 12, 2019.
[25] Tempo Online, NIS, 2019, www.insse.ro, Accessed on April 12, 2019.
[26]The World Factbook, 2019, Country Comparison: GDP - Real growth rate, https://www.cia.gov/library/publications/the-world-factbook/rankorder/2003rank.html, Accessed on April 12, 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

CHANGES AND TRENDS IN WINE PRODUCTION AND CONSUMPTION IN THE WORLD AND ROMANIA DURING THE PERIOD 2007-2018

Agatha POPESCU

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax: +40213182888, Email: agatha_popescu@yahoo.com

Corresponding author: agatha_popescu@yahoo.com

Abstract

The paper analyzed the evolution of wine production and consumption in Romania and at the world level in order to identify the main changes and trends in the period 2007-2018 using official data which have been processed using fixed and variable indices, correlation coefficients, regression functions, consumption/production rate, export/consumption rate, self sufficiency rate and import dependency rate. In 2018, Romania achieved 5.2 M. hl wine ranking the 8th in the EU-28 and the 13th in the world. The world output recovered reaching 202 M. hl. The top wine producers are: Italy, France, Spain, USA, Australia, Argentina, China, South Africa, Chile, Germany, Portugal, Russia and Romania. The area under vine raised, being 191 thou ha in 2018, for which Romania is on the 5th position in the EU-28 and on the 10th position worldwide. The world vine area declined to 7.4 M. ha. After a long depression, wine consumption recovered in 2018 and reached 5 M. hl, ranking Romania the 7th in the EU and the 12th in the world. The top wine consumers are USA, France, Italy, Germany, China, United Kingdom, Russia, Spain, Argentina, Australia, Portugal and Romania. World consumption remained relatively stable, 246 M. hl, being high in the main producing countries. Romania is ranked the 8th in the world for 29.9 l consumed per capita, but Romanians drink 1.5 times less wine than Portuguese, French, Italians, Swiss, Belgians and Australians. Romania's wine production, areas under vine and wine consumption have a positive impact on the world performance as proved by the correlation and determination coefficients, and regression functions In 2017, in Romania, the trade internationalization rate was 3.58%, the self sufficiency rate 92.32 % and the import dependency rate 10.86 %, which justified the wine import in small amounts. At the world level, 44 of 100 l wine are consumed from import. Wine production and consumption is expected to grow to satisfy better consumers' needs.

Key words**:** *trends, changes, wine, production, consumption, world, Romania*

INTRODUCTION

Wine is defined as "an alcoholic drink made of grapes which have been fermented grace to yeasts which converts sugar into ethanol, carbon dioxide and heat. Depending on the grape variety or hybrid and yeasts strains, wine could be of different types [9].

The history of wine dates back more than 7,000 years ago, in the Old Caucaz, Mesopotamia, Egypt, Iran, Greece, Italy, and even in China. The proofs found in Iran attested that wine was largely produced in the Neolithic era (around 5,400-5,000 BC) in Hajji Firuz Tepe [32].

The ceramic fragments including wine components in their texture, discovered in Georgia, proved that wine was preserved in ceramic bowls even since 5,980 BC [2]. In the archeological excavations made in Armenia, there were found Vitis vinifera seeds, a grape press, bowls for fermentation etc which proved the existence of the first vinery dating from 4,100 BC.

In Egypt, in Tutankhamun's tomb there were found jars of wine produced in the Nile Delta as in the old times, the pharaohs were buried together with their favored wines. Also, other proofs were found in Lebanon regarding the development of wine industry.

Vine was first in an wild form, but when the natural fermentation of carbohydrates into alcohol have been discovered, this was the crucial moment which convinced humans to domesticate it and pass to wine technology.

In Europe, the oldest land of the wine is supposed to be the ancient Thracia as here there were found traces which attest that vine

culture was a basic activity of the population living the Carpathian and Danube region even since the second millennium BC, as affirmed A. Griesbach, B.P. Harden and R. Billiard [32, 35].

Being the best navigators and traders, the Greeks have promoted and traded wine in the Mediterranean countries. During the Roman Empire, wine was also very much appreciated on various occasions and even sung by poets.

The vine was successfully cultivated in France and Germany, and from Spain it was spread to Americas. In this way, wine production and consumption increased from a period to another across the centuries. The appearance of Philloxera determined the European producers to cross the local varieties with American rootstocks and to create resistant hybrids to this pest [8].

"Wine is unique and a symbol of geography, history and culture of the region of its origin. Wine was considered the saint nectar of the Gods, the beauty of a region, the sublime stimulus of our senses. Dionysos and Bachus were the Gods of Wine for Greeks and Romans, and wine was used during celebrations, religious sermons, and also like food and medicine, being a magic and essential drink in the Mediterranean life style".

Wine production and trade have flourished in Europe where Bordeaux, Porto, Burgundia, and Tuscany have become well know producing and delivery centers and nowadays, wine is a part of our life and culture.

Wine content offer it a harmonious and perfectly balanced mixture of features such as: flavor, savor, acidity, sweetness, tannins [7].

Wine is frequently used as "a food adjacent" and what could be more pleasant than to taste a dish and feel the pleasure of a meal accompanied by a glass of wine". The assortment of wines with food
has become a real science and art to enhance the dining experience.

Wine is a healthy food and a moderate consumption is recommended to avoid the risk of heart and Alzheimer diseases. It is the greatest of medicine and where wine is lacking, drugs are necessary [30, 31].

The American experts consider that in a glass of wine could be found important diet components such as: 24-25 energy, 0.2-0.4 protein, vitamins: 0.7-0.9 B_1, 2-2.5 B6, 0.5 B_{12}, 1 Folate, Niacin 0.5-0.7, Ca 1, Iron 2.2-4.4, Ph 1.8, Zn 0.5-0.8 [32].

All these arguments are for sure the strong reasons why vineyards and wine production have developed across the time to meet the market requirements worldwide.

During the last two decades, the world wine production have registered a strange evolution characterized by high and low levels, mainly determined by the climate change and specific conditions in the producing countries.

From 278.8 million hl in the year 2000, the top level of 297.7 million hl was attained in the year 2004, and then production declined reaching the lowest level of 258 million hl like in the year 2012, but in 2013 a new output peak of 290.1 million hl was achieved. Since 2014, the world wine production went down, registering a catastrophic level in 2017, but in the year 2018, it was recorded the highest performance of 292 million hl.

Europe is the core of world production keeping 70% due to the EU-28 which is the main contributor with 60 % market share in the world wine output. The major producing countries: Italy, France, Spain have 48.1 % market all together. Besides the "leaders" of wine production mentioned before, other EU member states like Germany (3.5%), Portugal (1.8%), Romania (1.8 %), Hungary (1.2 %), Austria (1.06%), and Greece (0.75%) are important producers. On the American continent USA (8.4%), Argentina (5.1 %), Chile (4.6%), and Brazil (1.06), and we have to add Australia (4.4%), New Zealand (1.06%) and South Africa (3.3%) which also brought an important amount of wine to the world production [16, 37].

However, after a long period of continuous growth, the world wine consumption remained stable at the level of 2017, meaning about 246 million hl. In the main producing countries, wine consumption declined, while in the USA and China it registered an important growth. The difference of 46 million hl between production and

consumption is used for producing spirits, vinegar, and for assuring wine stocks [10].

Romania has a long tradition in producing wine and it is among the well known major producers and consumers in Europe and in the world, but it is not among the major exporting and importing countries as long it produces relatively enough wine for covering the internal market needs but not substantial amounts which could be delivered in the international market.

In this context, the objective of the paper was to present an analysis of wine production and consumption in Romania and also at the world level in the period 2007-2018 in order to identify the major trends, similarities and discrepancies, and the correlations existing among various indicators, the changes in production and consumption in Romania and in the major producing countries and states where wine is preferred the most.

MATERIALS AND METHODS

Study area.

Vitis vinifera cultivation and wine producing in Romania dates back more than 4,500 years ago.

"Tracia, was a viticultural region as it was considered the birth place of Dionysos" as sustained the historian A.D. Xenopol (1847-1920) and "vine culture was a traditional activity of the Thracs" as mentioned Nicolae Iorga (1871-1940). Strabon (66 BC-24 AC) mentioned that foreign populations were very much attracted by the vineyards of Dacia (the old territory of nowadays Romania) so that the King Burebista (82-44 BC.) decided to deforestate a part of the vineyards. Since the year 106, the Roman occupation contributed to the development of viticulture and vinification by means of the advanced techniques of vine cultivation and grape processing into wine as attested by "Dacia Felix medal", issued under The Emperor Traian (53-117)), and another medal issued under the Emperor Decius (201-251). In the Middle Age, the development of viticulture and wine making has continued on the Romanian territory as sustained by A.Verancsics (1504 -1573) and M.Bandini (1593-1650) [20, 35].

Along the centuries, vine growing and wine culture flourished inside Romania's frontiers, but also it has been promoted abroad by the quality, taste, flavor and other specific features of the Romanian wines which got golden medals in international competitions and were very well appreciated at the International fairs.

Romania's membership to OIV since 1928 is a guarantee of its prestige as an important wine producer in the world. The favorable conditions, the mild climate, the rich soils, the exposure of the slopes in the hilly areas, the good production potential of the local and imported vine varieties have led to a high performance in grape and wine production. That is way vine cultivation, wine producing, purchasing and trading have become a real business. However, there are still some critical aspects in viticulture and vinification related to the fragmentation of the land in small plots, the small size of the vineyards, the increasing percentage of the vine hybrids, the climate change producing droughts and rainfalls and other extreme meteo phenomena, the lack of labor force in spring season for plantations maintenance and at grape harvesting, as many workers prefer looking for a better paid job abroad.

The open frontiers after 2007 favored the import of wine brands which have enlarged the offer on the domestic market seeking for a new segment of wine consumers.

Data collection.

For setting up this study, the empirical data have been picked up from international and national official authorities providing information such as: International Organization of Vine and Wine (OIV), National Institute of Statistics (NIS), and Ministry of Agriculture and Rural Development (MADR).

The study was based on a large range of articles, books, textbooks, and sites delivering useful and updated information on wine production and consumption, the principal ideas being presented in this study and cited accordingly.

The period of reference of the analysis was 2007-2018.

The main indicators taken into consideration have been: (i)wine production in Romania and at the world level, the major producing countries and Romania's position in the world and in the EU; (ii) surfaces covered by vineyards in Romania and at the world level, the main countries with areas under vine, and the position of Romania in the world and in the EU; (iii) total wine consumption in Romania and its distribution by macroregions of development, wine consumption in the world and the top countries based on the records for this indicator, the position of Romania and in the world and in the EU; (iv) average wine consumption per inhabitant and year in Romania, in the world, in the main consuming countries, and Romania's position for this indicator; (v)average monthly wine consumption in Romania and its distribution in the territory by macroregion; (vi)average monthly expenditures for wine per household in Romania and its situation in the territory; (vii)average annual amount of wine bought per household in Romania and in the territory; (viii)consumption/production ratio in Romania and at the world level; (ix) export/consumption ratio in Romania and at the world level; (x) self sufficiency rate in Romania; (xi) import dependency rate in Romania.

The used methodology included:

-*Fixed basis index* was utilized to analyze the growth or decline at the end of the period compared to the level in the first year of the analysis;

-*Variable basis index* was used to explain the variations in different years compared to the previous levels;

-*Correlation coefficients and the determination coefficients* were determined between Romania's production and world production of wine to identify in what measure the level recorded by this country has an influence on the world level;

-*Regression equations* were used in the same purpose as mentioned above and for quantifying how much world production and consumption with increase or decrease due to the variations of these two indicators in Romania.

-*Consumption/Production Ratio* (C/P R) in Romania and at the world level was determined in relative values, according to the formula: C/P R = C/P *100;

-*Export/Consumption Ratio* (E/C R) in Romania and at the world level was calculated in relative value, using the formula: E/C R= E/C *100;

-*Self Sufficiency Rate* (SSR) in Romania was determined in relative values using the mathematical relation: SSR = (Production *100)/ (Production + Import - Export)

-*Import Dependency Rate* (IDR) in Romania was estimated in relative values using the formula:

IDR= (Import *100)/(Production + Import-Export).

RESULTS AND DISCUSSIONS

Wine production. Wine production in Romania registered large variations along the analyzed interval. In 2007, it accounted for 5,289 thousand hl, but in 2008 it reached the maximum level, i.e. 5,369.2 thousand hl. Then, wine production started to decline till 2010, when it reached the minimum level of 3,287.2 thousand hl, as a consequence of a combination of factors such as: economic crisis, on one side, and climate change, on the other side. In 2010, it represented 62.1 % of the 2007 level. In 2011, the achieved wine production was 4,058.2 thousand hl, by 23.3 % less than in 2007, but by 23.4 % more than in 2010.

In 2012, it declined again because the year was facing a terrible drought, but the grapes sugar content increased favoring sweeter wines. 2013 was a good year for wine production which raised by 54.4 % compared to 2012, but it was still by 3.4 % lower than in 2007.

Since 2014, wine production started to decrease again and continued this dynamics in 2015 and 2016 too. In 2016, it reached 3,267 thousand hl, by 38.3 % less than in 2007, and this was the minimum level carried out in the

analyzed period, as 2016 was a drought year which deeply affected the output.

In 2017, wine production improved its level reaching 4,264.1 thousand hl by 30.5% more than in 2016, but by 19.4 % less than in 2007. At last, the year 2018 was the most favorable so that wine production returned to its level of 2007, accounting for 5.2 million hl (Fig.1).

Fig.1.Wine production, Romania, 2007-2018 (Million hl)
Source: Own design based on the data from [10, 11, 14, 15, 16].

For its wine production, Romania ranked the 13th in the world, with a 1.78 % market share, after Italy, France, Spain, USA, Australia, Argentina, China, South Africa, Chile, Germany, Portugal and Russia. It also ranked the 5th in the EU-28 for 3.07 % market share.

The evolution of wine production in Romania followed the general trend at the world production of wine.

In the period 2007 -2013, the world wine production recorded a descending trend with the lowest level of 258 million hl in the year 2012. And this happened in the EU too, but it succeeded to keep its leader position in the world [18, 19].

The world production of wine was facing an important decline since 2013, with the lowest level accounting for 250 million hl in 2017, but the year 2018 brought a smile on the producers' face and a higher profit in the bank account for a top wine output of 292 million hl (Fig.2.).

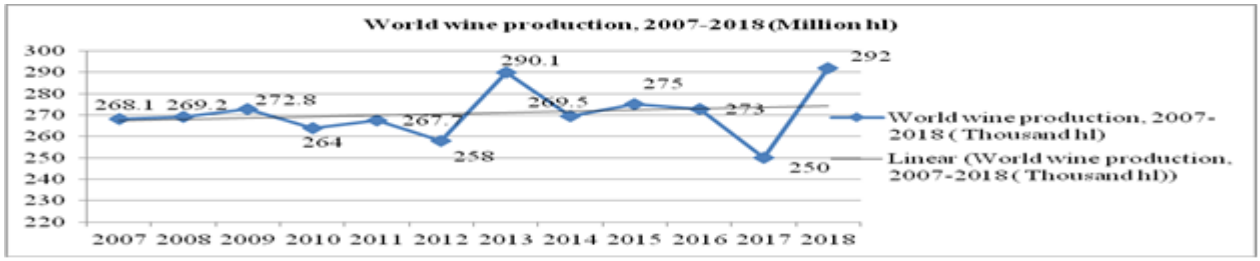


Fig.2.World wine production, 2007-2018 (Million hl)
Source: Own design based on the data from [10, 15].

Between the world and Romania's wine production it was found a correlation coefficient, r = 0.439, reflecting o moderate positive relationship, and the determination coefficient R^2= 0.1936 showed that only 19.36 % of the variation of the world production depended on the variations of the wine production in Romania. The regression equation proved the same, more exactly: Y= 6.1467 X + 244.61 showed that an increase by 1 unit of Romania's production could grow the world production by 6.1467.

The difference of 80.64 % of the world wine production variation is determined by the variations in production resulting from other wine producing countries.

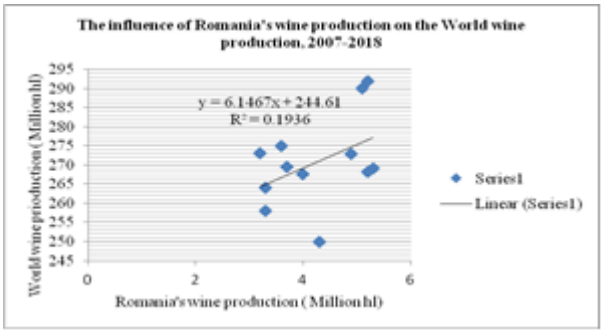


Fig.3.The impact of Romania's wine output on the world wine production, 2007-2018
Source: Own design.

It is about the production achieved in Italy, France and Spain, which are the principal countries with a record wine output in the world, in 2018, accounting for 19%, 17 % and respectively 15% in the world output. Also, another group of states; USA, Argentina, Chile, Australia and Germany contributes by 24 % to the world wine performance, and finally other countries among which we may found Romania covering the remaining difference of other 24 %. The positive variations in the top three countries have had a good impact on the world production, also the good output levels in the USA, Argentina, Chile, Germany and Romania had a positive impact, but the weak levels in South Africa and China influenced in a negative manner.

In the analyzed period, Romania's wine production was influenced first of all by climate change, higher and higher temperatures every year in summer season, freeze temperatures in spring at blooming or unexpected rainfalls in autumn before harvesting which affected yield.

The climate change in Romania determined research to find solutions to adapt vine growing to the new conditions. New varieties resistant to draft have been studied in the experimental plots of well know research and development stations. It was pointed out how important is to use high quality vine varieties adapted to the local conditions to get a higher economic performance in the vineyards in terms of grape yield, production and wine [4, 5, 23, 24].

Also, a tendency to use vine hybrids in the small households, the old plantations, the inadequate investments in new vineyards and the disruptions regarding the application of the technologies ahev also had a negative impact on production.

However, wine production in Romania was positively influenced by a slight increase of the cultivated surface with vine, 2.45 % from 178.1 thousand ha in 2007 to 182.5 thousand ha in 2017 and 191 thousand ha in 2018 (+7.2 % versus 2007), grace to the Government measures to stimulate viticulture development according to the Reconversion National Programme (Fig.4.).

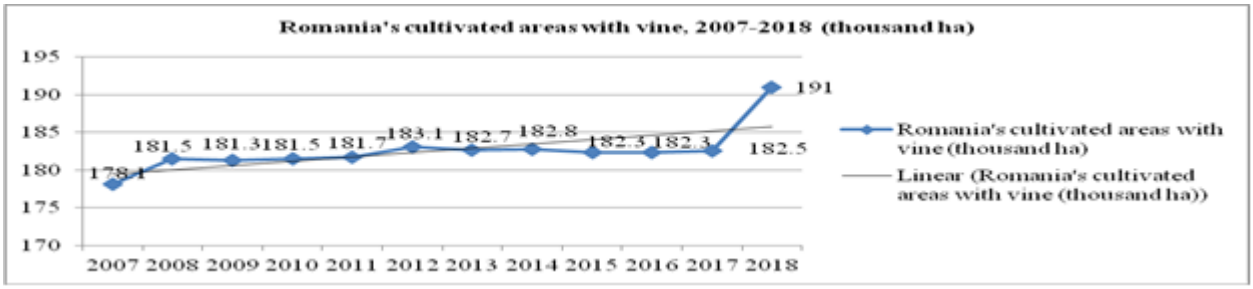


Fig. 4. The vineyards surface in Romania, 2007-2018 (Thousand ha)
Source: Own design based on the data from [10, 11, 16].

For its area covered by vineyards, representing 2.5 % of the world surface with vine, Romania came on the 10th position after Spain, China, France, Italy, Turkey, USA, Argentina, Chile and Portugal [1].

In the EU-28 area under vine, 3,194,267 ha in 2017, Romania ranked the 5th for the area with vineyards, representing 5.7 %, after Spain (30%), France (24.8%), Italy 20.2 % and Portugal (6.04 %). In the EU, the surface with vineyards has been relatively stable during the last years [6].

But, comparing to the general decreasing trend of the world surface with vineyards, in Romania it is a predominant increasing tendency, and the figure recorded in 2018 of 191 thousand ha was the consequence of the increased number of new plantations.

At the world level, in 2018 there were 7.4 million ha of vineyards, by 3.37 % less than in 2007. This was due to the variations in surface in different countries where Vitis vinifera is cultivated. In general, the surface with vine plantations is relatively stable in Spain, France, Italy, USA, Germany, it is decreasing in Portugal, Turkey and Greece, and it is growing in China, Argentina, and Chile (Fig.5.).

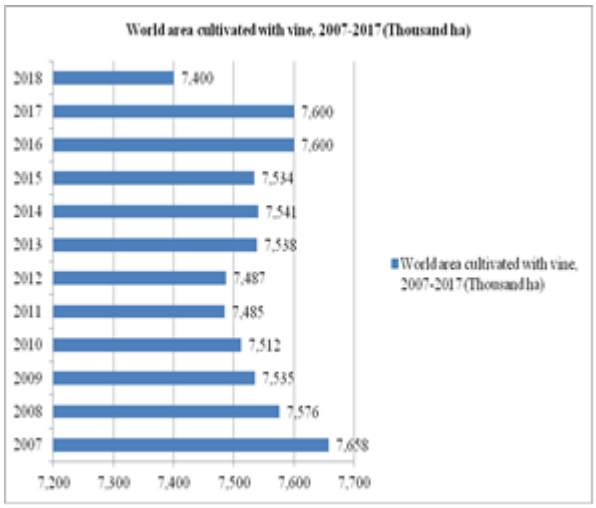


Fig. 5. The vineyards surface in the world, 2007-2018 (Thousand ha)
Source: Own design based on the data from [1, 10, 34].

Taking into account the different tendencies regarding the evolution of the surface with the vine plantations at the world level and in Romania, the correlation coefficient, r = 0.789 attested that the increased surface in Romania will have positive effect on the world surface. This was also, confirmed by the determination coefficient, R^2= 0.6235, which reflected that 62.35 % of the variation in the world surface with vineyards is influenced by the variation in Romania's surface cultivated with vine.
The regression equation Y= -17.763 X + 10,782 tells us that a decline by one unit of Romania's surface with vineyards will determine a reduction of the world area cultivated with Vitis vinifera by 17.763 units (Fig.6).

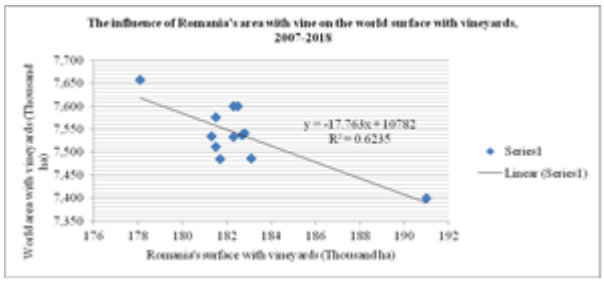


Fig. 6. The impact of the vineyards surface in Romania on the world surface with vine plantations, 2007-2018
Source: Own calculation.

Therefore, the difference of 37.65 % of the variation in the world surface with vine will be determined by the variation of the cultivated surface in the other producing countries.

In Romania, the vineyards are distributed in a varied manner in the territory taking into consideration the unfavorable and non favorable growing conditions.
Of the 191 thousand ha of vine plantations, 36.8 % are on the Moldova Hills, 29.3 % are on the Muntenia and Oltenia Hills, 9.2 % are on the Dobrudgea Hills, 7.2 % on the sandy and other favorable areas in the Southern Romania, 6.1 % are on the Danube River terraces, 5.4 % are on the Crisana and Maramures Hills, 3.8 % are in the Transilvania Plateau and 2.2 % are on the Banat Hills [29].
Of the total 4,264.1 thousand hl wine carried out in 2017 in Romania, 65.6 % came from the noble varieties and 34.4 % from vine hybrids.
To the 2,786.6 thousand hl wine obtained from vineyards growing noble varieties, the contribution of the viticultural regions was the following one; 43.8 % the Moldova Hills, 25.3 % the Muntenia and Oltenia Hills, 11.3 % the Transilvania Plateau, 9.2 % the Banat Hills, 6.5.% the Dobrudgea Hills, 3.8 % the Crisana and Maramures Hills and 0.15 % the Danube terraces and other 0.15 % the sandy and favorable soils in the South of the country.
Of the total 2,798.6 thousand hl wine produced by the noble varieties, 67.2 % represents white wine, which is dominant in the production structure by wine color, followed by 25.4 % red wines and 7.4 % rose wines [11].
Romania has many vineyards, but the main wine producers are Murfatlar, Constanta County, Jidvei, Alba County, Cotnari, Iasi County, Vincon, Vrancea County and Tohani, Prahova County whose market share accounts for 70 % in the whole wine output [12].

Wine consumption.

Wine consumption in Romania has followed an oscillating variation from a period to another. The analyzed period is a good example in this respect. In 2007, the wine consumption accounted for 5,526.3 thousand hl and it increased in the next year to the peak of 6,500 thousand hl. After 2008, it started to decrease, and the lowest level being registered

in 2010, i.e. 3,282.8 thousand hl. This decline was caused by the economic crisis which increased unemployment and diminish the income per household.

After that, wine consumption restarted to grow till 2013, when a new peak of 5,113.3 thousand hl was reached. Since 2013, wine consumption declined, may be due the beer competition in the hot months and its more convenient price or due to the new orientation of the consumers to wine of high quality, more costing, but more pleasant, a smaller quantity and a higher satisfaction.

This decreasing tendency looks to be similar to the descending trend of wine consumption in the EU and in the world.

In Romania, in 2017, wine consumption was 4.1 million hl, representing 74.19 % of the level attained in 2007. But the year 2018 was a surprising one because consumption reached 5 million hl, but still by 9.6 % smaller than in the year 2007 (Fig.7).

Fig.7.Wine consumption in Romania, 2007-2018 (Thousand hl)
Source: Own design based on the data from [10, 11].

In 2018, for the level of wine consumption, Romania ranked the 12th in the world, after USA, France, Italy, Germany, China, United Kingdom, Russia, Spain, Argentina, Australia and Portugal. Its share in the world wine consumption accounted for 2 %.

At the world level, wine consumption reached 246 million hl in 2018 being almost equal to the level recorded in 2017. However, at the world level the decreasing trend started many years ago and in 2007 and 2008 it was stabilized at 250 million hl, but then it continued to do down year by year reaching the minimum level of 239 million hl in the year 2014. After that, it restarted to increase slightly from a year to another reaching 246 million hl in the year 2018. This recovery was determined by an increased consumption in the Asian countries and also in the Western European states.

Therefore wine consumption at the world level has not varied too much, as in 2018 it was by 1.6 % less than in 2007. It have been stabilized at a level ranging between 240-246 million hl (Fig.8).

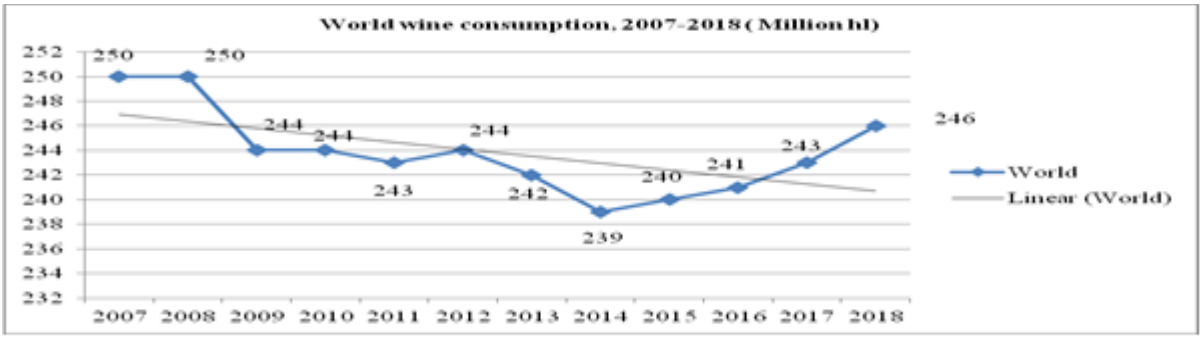


Fig. 8. World wine consumption, 2007-2018 (Million hl)
Source: Own design based on the data from: [10, 37].

At country level, wine consumption differs. The USA is on the top position as the wine consumption represents 13.4% of the world level, France came on the 2nd position with

10.8%, Italy with 9.1 %, Germany with 8.1 %, China 7.3 %, United Kingdom 5.04%, Russia 4.8%, Spain 4.4 %, Argentina 3.4 %, Australia 2.5 %, Portugal 2.2 %, and Romania 2 %. Therefore, the consumption in all these 12 countries together accounted for 73 % of the world wine consumption.

In the USA wine consumption has a visible ascending trend with a chance to continue its growth in the future. In Italy and China, during the last three years consumption is on an ascending trend, and in Spain restarted to grow. In Australia it keeps its increasing trend. However, in France, Germany and United Kingdom it continues to remain at a relative constant level.

The correlation coefficient between the wine consumption in Romania and the one at the world level is a positive and string one, r = 0.741. Also, the coefficient of determination, R^2= 0.5491 pointed out that 54.91 % of the variation in the wine consumption in the world is influenced by the variation of the consumption in Romania. The regression equation Y= 2.8953 X + 230.28 reflected that an increase by one unit of the wine consumption in Romania will contribute to the growth of the world consumption by 2.8953 units (Fig.9).

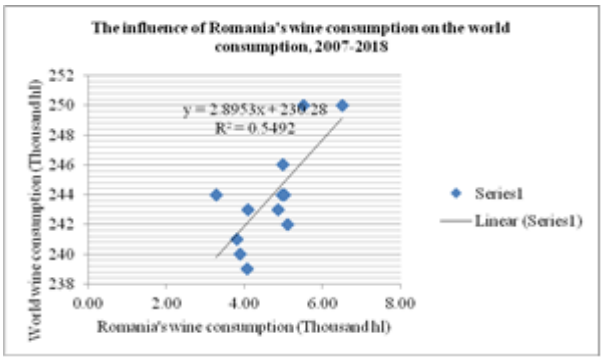


Fig. 9. The impact of Romania's wine consumption on the world consumption, 2007-2018
Source: Own design.

Average wine consumption per inhabitant registered a general declining trend between the year 2008 and 2016. If in 2007, a Romanian over 15 years old consumed 24.1 liters wine per year and in 2008 25.8 liters, when the economic crisis started and its effects affected the income per household, the Romanians begun to consume less wine and changed their habits consuming more beer which is cheaper than wine. The lowest consumption level, 18 liters/capita, was registered in 2016.After this year, the family budgets have slightly increased and wine consumption has started to recover as well, so that in 2017, wine consumption accounted for 20.5 liters and in 2018 for 29.9 liters (Fig.10).

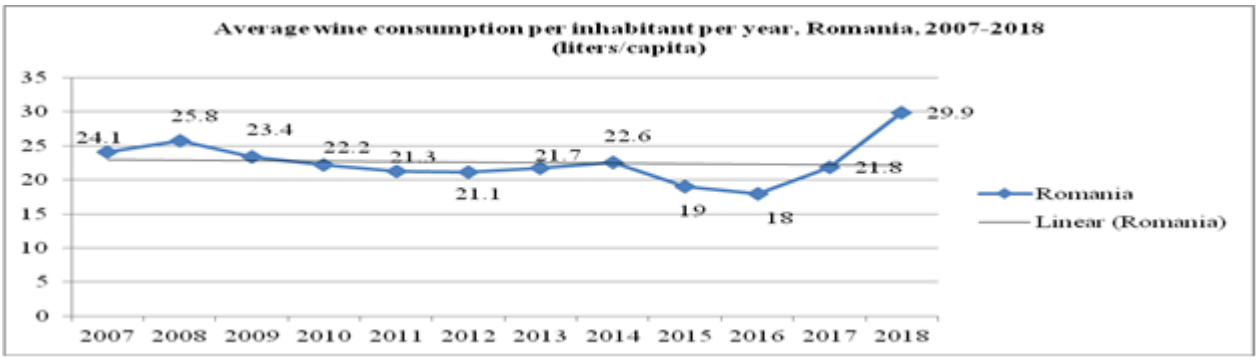


Fig. 10. Average wine consumption per inhabitant and year, Romania, 2007-2018 (Liters/capita)
Source: Own design based on the data from: [10, 13].

For its consumption per inhabitant per year of 29.9 liters in 2018, Romania ranked the 8th, compared to the 10th in 2017 for 20.5 liters. Therefore, average consumption in Romania has substantially increased by 45.8 % from 2017 to 2018.

However, in 2018. a Romanian drinks 2 times less than a Portuguese, 1.67 times less than a French, 1.45 times less than an Italian, 1.26 times less than a Swiss, 1.05 times less than a Belgian or an Australian [27].

If we look at the figures presented in Fig.11, one may notice that the wine consumption in 2018 has registered a considerable increase in almost all the countries representing the top consumers. More exactly, the change by country was the following one: Portugal 38 %, France 25.5 %, Italy 14.7 %, Switzerland

18.1 %, Belgium 27.5%, Austria 27.5 %, Romania 45.8 %, Hungary 42.9 %, Sweden 27.1 %, Germany 12 %, Spain 22.2 %, Argentina 24 %, Netherlands 13.2 % and United Kingdom 13.5%.

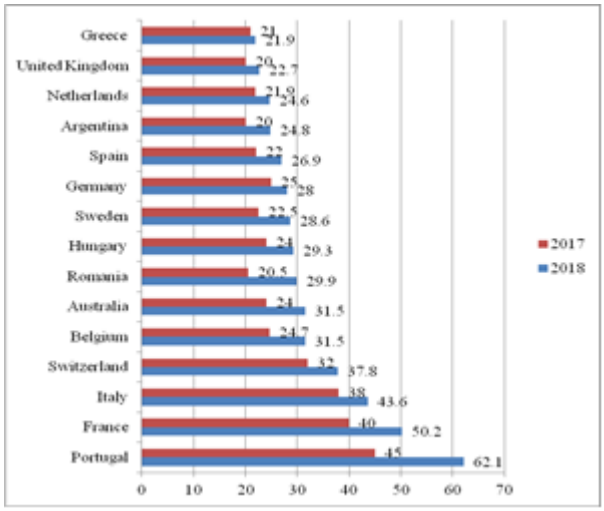


Fig. 11. Average wine consumption per inhabitant per year in the main consuming countries in 2018 versus 2017
Source: Own design based on the data from [19, 17, 36].

The average wine consumption in the world accounted for 3.5 liters/capita in 2017 but in 2018 it declined to 3 liters.
But, in the world there are also countries where average wine consumption is very small. It is about the Islamic countries such as Pakistan, Yemen, Afganistan, Syria, Bangladesh, Eritrea, Egypt, Sudan, Saudi Arabia where consumption ranges between 0.00019 liters in Pakistan to 0.00354 liters in Saudi Arabia [28].
Considering consumption in terms of number of bottles of 0.75 liters, a Romanian consumer drinks only about 29 bottles of wine a year compared to the top consumers in the world: Norfolk Island 77.8 bottles, Vatican City 76, Andorra 66, Croatia 63.3, Portugal 61.8, Slovenia 57.5, Macedonia 55.2, France 54.4, Switzerland 50 and Italy 50 bottles [3].
In Romania, the average monthly wine consumption per inhabitant varied between 0.933 liters in 2008 to 0.892 liters in 2017, according to National Institute of Statistics [13]. (Fig.12).
The wine consumption varies from a region to another depending on the local traditions in vine growing and producing, urban or rural environment, education level, age structure of the population and income level per household.
The highest average wine consumption/month is in the South West region (about 2 liters), followed by the North Eastern region (1.5 liters) and the lowest level in the West region (about 0.25 liters).
In the analyzed period, the highest average consumption was found in the macroregion of development M2, with a general increasing trend from 1,330 l/capita in 2008 to 1,396 l in 2017 (+5%).

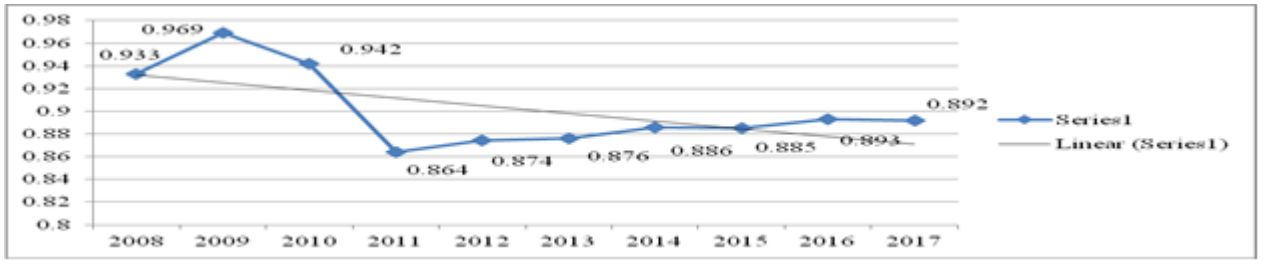


Fig. 12. Dynamics of average monthly wine consumption in Romania (liters/inhabitant)
Source: Own design based on the data from [9].

On the 2nd position came the macroregion M4 where the average wine consumption per month varied between 1.165 liters in 2008 to 0.919 l in 2017, reflecting a decline (-21.2 %). On the 3rd position was situated the macroregion M1 where the average monthly consumption increased from 0.546 l/capita in 2008 to 0.676 l in 2017 (+23.8%). At last, the macroregion M3 ranked the 4th for 0.542 l/capita in 2017 by 17.9 % less than in 2008 (0.660 l/capita).

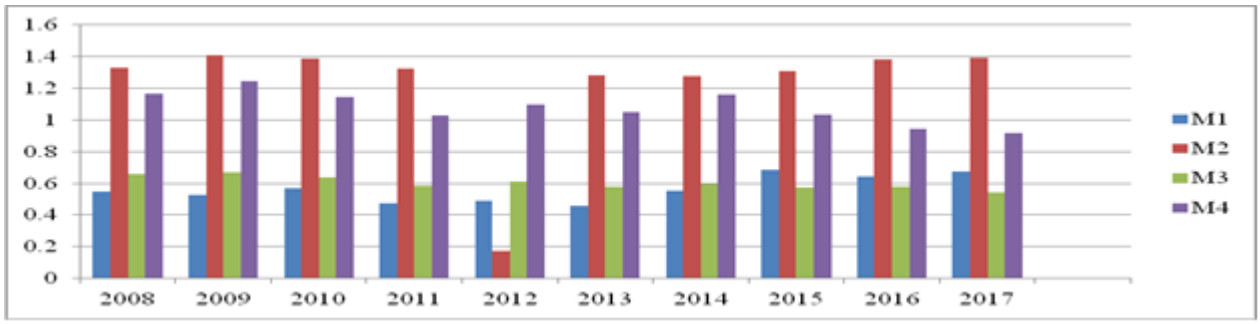


Fig. 13. Dynamics of average monthly wine consumption by macroregion of development in Romania (liters/inhabitant)
Source: Own design based on the data from [9].

Depending on the environment where the people is living, in Romania wine consumption is different in the urban areas compared to the rural ones.

In the rural areas, wine consumption in the rural areas is higher than in the urban localities, because most of the households have small or large surfaces under vine and produce wine for family needs and this production and consumption is not recorded in the official evidence.

More than this, in the rural areas, wine is also bought from shops, but in the most cases it is about the cheapest wine of lower quality, taking into account the lower income level of the rural population.

In the urban environment, people has a higher income and prefer to drink a higher quality wine, but less, most of wine bottles being purchased from supermarkets and have a controlled origin.

Age is another factor which creates differences among people regarding wine consumption. In general, the young people of 15-24 years old used to drink about 0.4-0.5 liters of wine per month, while the people older than 65 consume 1.1-1.2 liters/month.

The education level could also influence wine consumption. In general, the people having a lower education level consume more wine per month compared to the people with the highest education level. Regarding the wine consumption habits, the people with a higher education level prefer to drink wines of a higher quality and less, therefore they are tempted to pay more for a bottle of wine compared to the people who is less educated.

Income level is the key factor influencing the purchasing decision and of course, consumption. The persons earning a higher income per month are tempted to pay more for a bottle of a high quality wine, but to consume less. The people having low earnings prefer to buy cheap wines and to consume more.

The household size has also an impact on consumption habits. In general, the larger the household, the lower the wine consumption. The families consisting of two members drink more wine (1.1-1.3 liters per month) than a larger household.

In Romania where summers are hot, and winters are cold, it looks that there are seasonal differences regarding wine consumption. In summer season, the people is tempted to consume more beer, in the fall and winter months and in spring season around Easter, the Romanians prefer to consume more wine.

Therefore, in Romania, wine consumption has large variations, but the general trend is a declining one, except the years 2017 and 2018 when it looks a recovery of return to Bachus' elixir.

This is a similar tendency with the one in the EU member states and at the world level. Probably the diminished wine consumption was due to the wine price, the competition of beer and the living standard. In the countries where the population has a higher living standard, wines are of a higher quality, are more expensive and this could be a reason to consume a smaller amount but to pay more for a good wine and have a special satisfaction drinking a glass of wine [12].

In terms of the level of spendings for drinking wine, there are also large variations among people. The record in the world is kept by Norfolk Island, close to Australia and New Zealand, where the expenditures for wine accounts for about £ 486/capita and Switzerland where the people pay a little less, £ 462/capita [3].

The annual wine consumption in terms of the number of bottles of 0.75 liters per inhabitant, Romania is not among the top consumers in the world like: Norfolk Island (77.8 bottles), Andorra (66), Croatia (63.3), Portugal (61.8), Slovenia (57.5), Macedonia (55.2), France 954.4), Switzerland (50) and Italy (50) [3].

In Romania, the average number of wine bottles consumed per year by a person is 29. But, we have to consider that this figure does not reflect the reality, because in Romania it is commercialized not only bottled wine, but also bulk wine, and in the country side, the people practice "barter" many times, so that it is not possible to exactly calculate wine consumption.

Average amount of wine purchased per household in Romania increased from 0.199 liters in 2008 to 0.268 liters in 2017 (+34.6%), but there are variations from a macroregion to another. While in the M2 macroregion, the level of this indicator increased from 0.252 liters per household to 0.286 liters (+13.4%), in the macroregion M3 it increased from 0.259 liters to 0.297 liters (+14.6%), in the macroregion M4 it raised from 0.113 liters to 0.196 liters (+73.4%) and in the macroregion M1 it also raised but from 0.141 liters to 0.273 liters (+93.6%).

Therefore, in 2017, the decreasing order of the macroregions based on the average quantity of wine purchased by a household per year was the following one: M3, M2, M1 and M4 (Fig.14).

Fig. 14. Average annual amount of wine purchased per household in Romania by macroregion (liters per household/ year)

Source: Own design based on the data from [13].

Romanians are wine drinkers and prefer mainly white and red wine, and less rose wines. There are many occasions when wine is consumed such as: celebrations of birthdays, weddings, marriages, visits, holidays etc and the Orthodox calendar is full of Saints so that the ones wearing a saint first name have an occasion to celebrate and offer wines and other alcoholic drinks to their guests.

Wine wines are the most preferred by Romanians at the formal events, while red wines are consumed mainly in the family and in the couple.

Concerning consumers' preference for wine depending on its origin, most of the Romanians prefer to buy and drink Romanian wines (75%), 21 % prefer to buy wines imported mainly from the EU and 4 % prefer wines to purchase extra EU wines. Women prefer in general imported wines from France, Italy and Spain, while men prefer especially Romanian wines [33].

Also, wine comes on the 6th position among the Romanian food products which represents 75 % of total food purchasing after eggs (88%), poultry meat (84%), bread (84%), pork (83 %) and meat preparations (82 %).

Regarding consumer preferences for various types of wines, it was found that about 58 % Romanians prefer dry wines, 40 % semidry or semisweet wines and only 2 % prefer sweet wines [26].

In general, Romanians accept to pay between Lei 18 and Lei 35 for a wine bottle purchased from a supermarket or a specialized shop. But, in special occasions, when it is about wine bottle as a gift, they are tempted to pay more.

Taking into account the wine brand in relationship with the grape variety, the recent studies made on samples of consumers proved that many people do not know exactly what brand and type of wine to buy. However, the most known wine varieties are "Grasa de Cotnari" and "Feteasca Alba" which are in the top of the preference and consumption. Also, the top vineyards which are known by consumers are Cotnari, Murfatlar and Odobesti [33].

Important relationships between wine consumption, production, export and import.

Between these indicators: production, consumption, export and import is a close relationship and reflects in what measure a country is able to cover consumption needs by production, in what measure is able to export from the internal wine production, in what measure wine demand/offer ratio is balances, in what measure import is needed to cover the requirements of the domestic market.

Consumption/Production ratio in Romania reflects that in the period 2007-2017, consumption level was higher than production, in other words, wine production was not able to cover wine demand, and imports were justified to complete and diversify the wine offer. The only years when consumption was almost equal to production were 2009 and 2010, which reflected the impact of the economic crisis on consumption and the year 2013. In all the other years, consumption imposed to complete production by import.

The same ratio at the world level reflects that in the analyzed period wine consumption is smaller than production, therefore it remains an amount of wine for stocks and other purposes (spirits etc) (Fig.15).

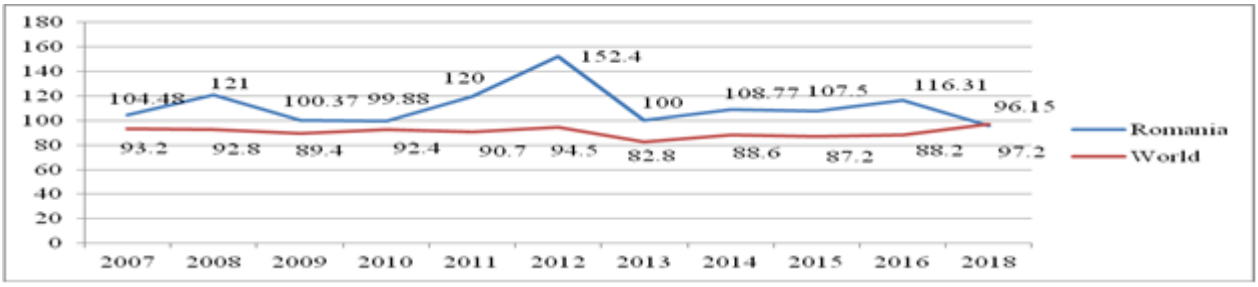


Fig. 15. Wine Consumption/Production ratio in Romania and at the world level, 2007-2017 (%)
Source: Own design.

Export/Consumption ratio is very small in Romania as the country is not among the top wine exporting states in the EU and in the world.

In 2017, the wine export volume of Romania was 1.47 million hl, representing 1.36 % of the world export. Therefore its exports are pale and non significant compared to the ones of Spain (21.4), Italy (19.8%), France (13.7), Chile (9%), Australia (7.2%), South Africa (4.1%), Germany (3.5%), USA (3%), Portugal (2.7%), New Zealand (2.3%) and Argentina (2 %) which are the top exporting countries [21,22, 25, 27].

However, the export/consumption ratio registered an increasing trend from 2.58 % in the year 2007 to 3.58 % in the year 2017. These figures reflect that consumption is based on a small proportions on imported wines, as production is almost enough to cover the internal market requirements.

At the world level, the situation is completely different. The evolution of the export/consumption ratio is continuously increasing.

From 35 % in 2007 in 2017 it accounted for 44.2 % reflecting that wine is more and more consumed out of its producing countries. Therefore, more than one third of the consumed wine has its origin in other countries.

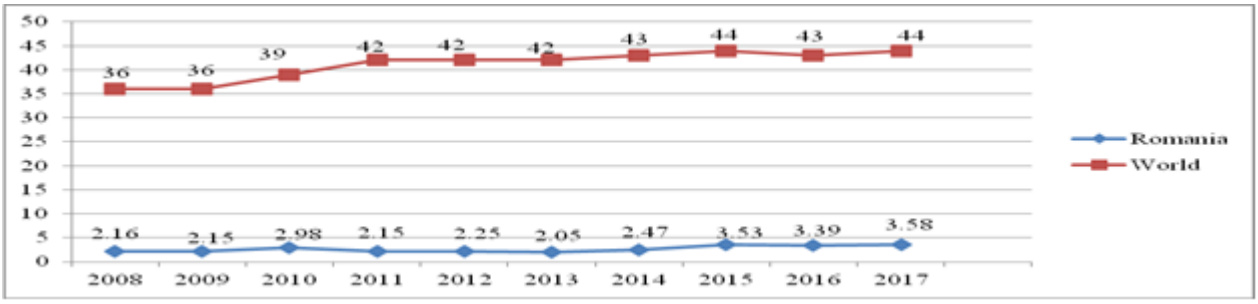


Fig. 16. Wine Export/Consumption ratio in Romania and at the world level, 2007-2017 (%)
Source: Own design.

Self Sufficiency Ratio (SSR) varied from a year to another and in general is lower than 100. This means that, production is not enough to entirely cover consumption. In 2017, the SSR was 92.32 % while in 2007 it accounted for 95.7 %. The lowest SSR in the analyzed period was 83.35 % in 2011, while the highest ratio was 99.6 % recorded in the year 2009 (Fig.17).

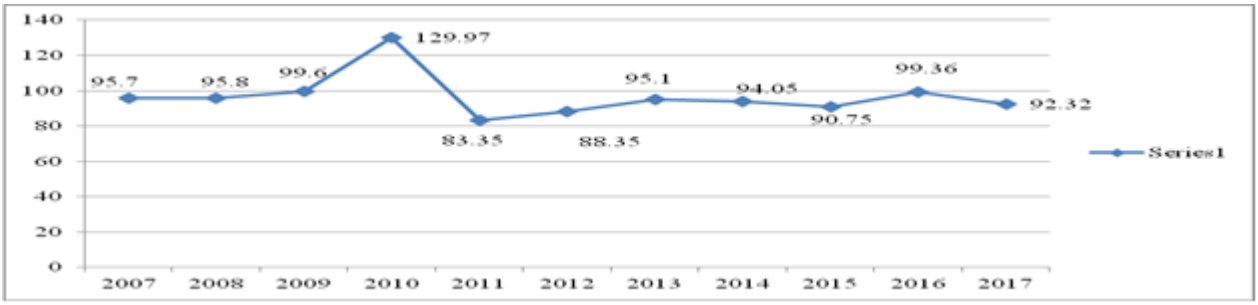


Fig. 17. Dynamics of wine self sufficiency rate in Romania, 2007-2017 (%)
Source: Own design.

Import dependency ratio (IDR) had in general low values in the analyzed period, except a few cases. It reflects that Romania needs to make some imports to complete the domestic offer of wine, but the percentage of imports are enough small. In 2007, the IDR was 6.88 % and in 2017 it was noticed a slight increase to 10.86 %. However, in the analyzed interval, there were a few peaks: 8.81 % in 2010, 18.7 % in 2011, 14.5 % in 2012 and 12.72 % in 2015. The lowest IDR level was recorded in the year 2009 and accounted for only 2.61 % (Fig.18).

Fig.18. Dynamics of wine import dependency ratio (IDR), Romania, 2007-2017 (%)
Source: Own design.

CONCLUSIONS

Romania has a long tradition in vitiviniculture being well known among the well known major producers and consumers in Europe and in the world. its performance is sustained by the favorable soils and climate, hilly slopes orientation to sun, good production potential of vine varieties, investments in new vineyards and wine producing technologies.

Wine production in Romania accounted for 5.2 million hl in 2018 after a long period of up and down variations mainly caused by climate change. For its wine production Romania ranked the 6th in the EU-28 (3.07% market share) and the 13th in the world (1.78% market share) after Italy, France, Spain, USA, Australia, Argentina, China, South Africa, Chile, Germany, Portugal and Russia.

The evolution of wine production in Romania followed the general trend of the world production whose level attained 292 million hl in 2018, a record after the critical level in 2017. The leaders in producing wine are Italy, France and Spain (50 % market share).

Wine production in Romania was positively influenced by the 7.2 % growth of the area under vine which reached 191 thousand ha in 2018, bringing Romania on the 5th position in the EU (5.97 % market share) and the 10th position for 2.5 % of the world surface with vineyards.

At the world level in 2018, there were 7.4 million ha under vine, meaning 3.37 % less than in the first year of the analyzed period, therefore the surface had a general declining trend.

Wine consumption in Romania registered large variations, and a decline after 2013, but since 2017 it recovered and reached 5 million hl in 2018, representing 3.8 % of the EU consumption and the 7th position, and the 12 position in the world for 2 % market share after USA, France, Italy, Germany, China, United Kingdom, Russia, Spain, Argentina, Australia and Portugal.

However, wine remains in competition with beer in Romania in the warm season, but also the preference of consumers for wines of high quality is increasing.

At the world level, wine consumption in relatively stable, after the decline registered in 2014, in 2018 it accounted for 246 million hl a figure similar to the 2007 level. Consumption is high in the main producing countries.

A Romanian consumed about 29.9 liters wine/year in 2018, after a long period of a lower consumption, and this brought Romania on the 8th position in the world. However, Romanians drink 1.5 times less wine than Portuguese, French, Italians, Swiss, Belgians and Australians.

This increasing trend in wine consumption was noticed at the world level as well.

In Romania, wine consumption per capita is higher in the rural areas, in case of the people older than 65, with a lower education level and lower income per household.

The study reflected that the EU-28 is the leader regarding vine growing areas, wine production and consumption, and in export as well having the following market share in the world market: 44.3%, 56 %, 54 % and respectively 74.7 %.

The correlation coefficients, the determination coefficients and regression functions proved that Romania's wine production, cultivated surface with vine and wine consumption have had and continues to have a high and positive influence on the world performance.

Consumption is higher than production in Romania which justify the import of wine to cover the internal market needs, while in the world consumption is below production.

The export/consumption rate in Romania is very low, accounting for 3.58% in 2017 reflecting that a small amount of wine is imported. But, at the world level, the trade internationalisation rate has doubled its level reaching 44 % in 2018, reflecting that of 100 liters of consumed wine, 44 liters were coming from import.

Being below 100, the self sufficiency rate of 92.32 % and the import dependency rate of 10.86 % in 2017 justified the import of wine in Romania, but not in large quantities.

As a final conclusion, as long as wine is an attractive product for consumption, production is expected to continue to grow

and consumption as well in the both in traditional regions and in many other areas of the world and in Romania as well. This will encourage international trade with wines to satisfy better consumers' preferences and increase profit of the main world traders.

REFERENCES

[1]Aurand, J.-M., 2018, State of the Vitiviniculture World Market, OIV, November 2018, http://www.oiv.int/public/medias/5958/oiv-state-of-the-vitiviniculture-world-market-april-2018.pdf, Accessed on April 20, 2019.

[2]Barnard, H., Douley, A.N., Areshian, G., Gasparyan,B., Faull, K.F., 2011, Chemical evidence for wine production around 4000 BCE in the Late Chalcolithic Near Eastern highlands, Journal of Archaeological Science. Vol. 38, pp. 977-984.

[3]Clissitt, C. 2018, The World's Biggest Wine Drinkers 2017, https://www.movehub.com/blog/wine-consumption-worldwide-2017/, Accessed on April 23, 2019.

[4]Enache, V., Simion, C., Donici, A., Tabaranu, G., Popescu, A., 2010, Research on the Behavior of some Wine Grape Varieties in the context of Climate Change at Dealu Bujor Vineyard, Scientific Papapers Horticulture, UASVM Iasi (Lucrari stiintifice UASVM Iasi Seria Horticultura), Vol.53(1), pp.425-430

[5]Enache, V., Popescu, A., Simion, C., Donici, A., Tabaranu, G., 2010, Research Concerning Climate Change and Grape Production in the Eastern Romania, Bulletin of UASVM Cluj-Napoca Romania, Horticulture, No.67(1)/2010, pp..192-197.

[6]EU Wine Market Data Portal, https://ec.europa.eu/agriculture/wine/statistics_en, Accessed April 20, 2019

[7]Ghica, V., 2014, Wine history and culture (Istoria si cultura vinului), https://www.stiriagricole.ro/in-vino-veritas-istoria-vinului-562.html, Accessed on April 25, 2019.

[8]History of Wine (Istoria vinului), https://www.crameromania.ro/informatii-utile/istoria-vinului-vita-de-vie-432.html, Accessed on April 25, 2019.

[9]Johnson, H., 1989, Vintage: The Story of Wine. Simon & Schuster. pp. 11–16.

[10]Karlsson, P., 2019, World wine production reaches record level in 2018, consumption is stable, https://www.bkwine.com/features/more/world-wine-production-reaches-record-level-2018-consumption-stable/, Accessed on April 20, 2019.

[11]MADR Horticulture-Viticulture, www.madr.ro/horticulture/viticultura-vinificatie.html, Accessed on 21 April 2019.

[12]Nela, S., 2016, Where is Romanian wine industry heading? Economic Review, 68:3, pp.160-177

[13]NIS Tempo Online, 2019, www.insse.ro, Accessed on April 20, 2019.

[14]OIV, Global economic vitiviniculture data, Very high world wine production in 2018, estimated at 282 mhl, after a historically low 2017 harvest Press release, Paris, 26 October 2018, http://www.oiv.int/public/medias/6307/oiv-press-release-global-economic-vitiviniculture-data-octob.pdf, Accessed on April 20, 2019.

[15]OIV, State of the VitivinicultureWorld Market, April 2018, http://www.oiv.int/public/medias/5958/oiv-state-of-the-vitiviniculture-world-market-april-2018.pdf, Accessed on April 20, 2019.

[16]OIV, 2018, Global vitiviniculture data, 26 Oct.2018, http://www.oiv.int/public/medias/6307/oiv-press-release-global-economic-vitiviniculture-data-octob.pdf, Accessed on April 20, 2019.

[17]Per capita wine consumption-top 30 and other selected countries, https://static1.squarespace.com/static/552d3a93e4b0a7ee3a2ce896/t/5a866809e4966bc895e9432d/1518757899440/Per+capita+consumption+2017.pdf, Accessed on April 23, 2019.

[18]Pirvutoiu I, Popescu, A., 2013, Study concerning the EU Position in the World Wine Production, Scientific Papers Agricultural Management (Lucrari stiintifice Management agricol), Series I, Vol.XV (1), p.242-247.

[19]Pirvutoiu, I, Popescu Agatha, 2013, Considerations regarding World Wine Market, Annals of University of Craiova, Series Agriculture, Montanology, Cadaster, Vol.XLIII(2), p.170-175.

[20]Pitigoi, V., Topul celor mai mari bautori de vin din lume, 2012, http://www.ziare.com/magazin/inedit/topul-celor-mai-mari-bautori-de-vin-din-lume-1155920, Accessed on April 25, 2019.

[21]Popescu, A., 2006, Wine market in the E.U. countries, Annals of Craiova University, Series Biology, Horticulture, Technology of Agricultural Products Processing, Environment Engineering in Agriculture, Vol.XI (XLVII), pp. 25-30.

[22]Popescu, A., 2007, Romania's Wine Export, Annals of Craiova Univresity, Series Biology, Horticulture, Technology of Agricultural Products Processing, Environment Engineering in Agriculture, Vol.XII (XLVIII), pp.17-22.

[23]Popescu Agatha, Simion Cristina, Tabaran Gabriel, Simion Ion – 2008 – A comparative study concerning the economic efficiency in the producing of high quality grafted vines, Simpozionul stiintific cu participare internationala " Horticultura durabila – Prioritati si perspective ", Universitatea Craiova, Facultatea de Horticultura, 24-25 octombrie 2008, Analele Universitatii Craiova Seria Biologie, Horticultura, Tehnologia Prelucrarii Produselor Agricole, Ingineria Mediului in agricultura, Vol.XIII(XLIX), p.69-74

[24]Popescu Agatha, Enache Viorica, Simion Cristina, Donici Alina, Tabaranu G, 2009, Research concerning the economic impact of climate change upon grape production, The 8th International Symposium Prospects of the 3rd Millennium Agriculture, UASVM Cluj

Napoca, Oct 7-10 , 2009, Bulletin of UASVM Cluj Napoca Romania Horticulture, No.66 (1-2)/2009, p.366-372
[25]Popescu, A., 2013, Research regarding the dynamics of the EU-27 position in the wine market, Annals of University of Craiova, Series Agriculture, Montanology, Cadastre, Vol.XLIII(2) pp.176-181.
[26]Romanian wine consumer's profile in 2018, An online study (Profilul consumatorului român de vinuri în 2018.Studiu online) https://www.crameromania.ro/evenimente/profilul-consumatorului-roman-de-vinuri-401.html, Accesat 25 aprilie 2019
[27]Rosca, C., 2018, Wine consumption recovered its growth in 2017 and passed over 20 liters per capita: The leaders are the Portuguese and French who sued to drink 2 times more (Consumul de vin a revenit in crestere in 2017 si a sarit de 20 de litri per capita: Liderii sunt portughezii si francezii care beau de doua ori mai mult), https://www.zf.ro/companii/retail-agrobusiness/consumul-de-vin-a-revenit-pe-crestere-in-2017-si-a-sarit-de-20-de-litri-per-capita-liderii-sunt-portughezii-si-francezii-care-beau-de-doua-ori-mai-mult-17174188, Accessed on April 20, 2019.
[28]Smith, O., 2017, Revealed: The countries that quaff the most wine per capita, https://www.telegraph.co.uk/travel/maps-and-graphics/wine-consumption-per-capita-by-country/, Accessed on April 23, 2019.
[29]Stoian, R., Boboc, D., Stoian, M., 2013, Changes And Trends On Wine Market In Romania, pp.50-58, http://www.cafee.ase.ro/wp-content/upload/2013edition/file(7).pdf, Accesat 23 aprilie 2019.
[30]Talmud, Tractate Berachoth 35n and 58b, cited in: -The Origins and Ancient History of Wine, 2005, Editors Patrick E. McGovern, Stuart J. Fleming, Solomon H. Katz, Routledge Tailors and Francis Group, e-books, https://books.google.ro/books?id=4ELANhFQ0QMC&pg=PT383&lpg=PT383&dq=R.+Billiard+archeologist&source=bl&ots=uL1rswbXyS&sig=ACfU3U2D5tCngiNp5IyALXRNZ8iHbc3l0g&hl=ro&sa=X&ved=2ahUKEwjDr7Wb6-_hAhXGAxAIHYVMCfQQ6AEwCHoECAcQAQ#v=onepage&q=R.%20Billiard%20archeologist&f=false, Accessed on April 20, 2019.
[31]Tanase, S., 2012, History of wine (Istoria vinului), https://www.stelian-tanase.ro/istoria-vinului/, Accessed on April 25, 2019.
[32]The Origins and Ancient History of Wine: Food and Nutrition in History, 2005, Editors Patrick E. McGovern, Stuart J. Fleming, Solomon H. Katz, Routledge Tailors and Francis Group, e-books, https://books.google.ro/books?id=4ELANhFQ0QMC&pg=PT383&lpg=PT383&dq=R.+Billiard+archeologist&source=bl&ots=uL1rswbXyS&sig=ACfU3U2D5tCngiNp5IyALXRNZ8iHbc3l0g&hl=ro&sa=X&ved=2ahUKEwjDr7Wb6-_hAhXGAxAIHYVMCfQQ6AEwCHoECAcQAQ#v=onepage&q=R.%20Billiard%20archeologist&f=false, Accessed on April 20, 2019.
[33]Tudose, A., Haita, C., 2014, Research Report. Bottled wine market (Raport cercetare. Piata de vinuri imbuteliate), Magazinul Progresiv. Ipsos. https://www.magazinulprogresiv.ro/sites/default/files/resources/files/studiu_vinuri_ipsosresearch.pdf, Accessed on April 24, 2019.
[34]Vineyard surface area worldwide from 2000 to 2017 (in 1,000 hectares), https://www.statista.com/statistics/240635/total-vineyard-areas-worldwide-and-in-europe/, Accessed on April 20, 2019.
[35]Viticultural Romania - Historical milestones, (Romania viticola- repere istorice), https://www.winetaste.ro/noutati/romania-viticola-repere-istorice, Accessed on April 25, 2019.
[36]Wine consumption worldwide in 2017, by country (in million hectoliters) https://www.statista.com/statistics/858743/global-wine-consumption-by-country/, Accessed on April 23, 2019.
[37]Wine Industry Overview, WWTG, November 2017, https://www.trade.gov/td/ocg/2017WWTG.pdf, Accessed on April 20, 2019.
[38]World Vitiviniculture Situation 2018, OIV Statistical Report on World Vitiviniculture, http://www.oiv.int/en/oiv-life/oiv-2018-report-on-the-world-vitivinicultural-situation, Accessed on April 20, 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

CHANGES, TRENDS AND RELATIONSHIPS BETWEEN AVERAGE INCOME AND CONSUMPTION EXPENDITURES PER HOUSEHOLD IN ROMANIA IN THE PERIOD 2007-2017

Agatha POPESCU, Toma Adrian DINU, Elena STOIAN

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Emails: agatha_popescu@yahoo.com, tomadinu@yahoo.fr, stoian_ie@yahoo.com

Corresponding author: agatha_popescu@yahoo.com

Abstract

The paper analyzed the dynamics of average monthly income (AMI) and average monthly expenditure (AME) per household and the relationships between these indicators of living standard in Romania in the period 2007-2017. The dynamic analysis, descriptive statistics, correlations, and regression functions were used to process data. The results pointed out that both AMI and AME per household increased in Romania, but income growth rate was higher than expenditure increase rate. In the rural area, AMI per household is 64.3 % of the urban average and 76.1 % of the national one. AME is the highest in the urban area. In the rural households it represents 77.1 % of the urban one and 85.6 % of the national average. A person living in the rural area spends three times less money than an urban citizen. The share of AME in the AMI decreased from 80.7 % in 2007 to 66.5% in 2017, because the income growth rate was higher than the spending rate. In the rural communities, this percentage was 74.9 in 2017, higher than in the urban area. The expenditures on food and non alcoholic beverages also increased, being higher in the urban area. The share of food and non alcoholic beverages in AME is 29 % in the rural area, the highest in the country. AME per household accounts for 61.1 % of GDP, placing Romania on the 8th position in the EU-28. Also, Romania comes on the top position for 17 % share of expenditure on food and non-alcoholic beverages in GDP. The correlations proved a high and positive connection between income and expenditure. According to the regression equations, an AMI increase by Lei 100 will increase AME by Lei 52.9 at the national level, by Lei 49.30 in the urban household, by Lei 58.96 in the rural household, will raise consumption expenditure on food and non alcoholic beverages by Lei 12.02 nationally, by Lei 10.39 in the urban household and by Lei 14.58 in the rural one. Household income is still lower in Romania compared to other EU countries. A new strategy is required to increase population's income in order to improve life quality and reduce the discrepancies with the other EU countries.

Key words: *income per household, expenditure per household, trends, changes, correlations, regression functions, rural versus urban areas, Romania*

INTRODUCTION

Between income and consumption it is a close relationships as humans cover their needs by consumption and this involves income. The dependence of consumption, C, on income, Y, is reflected by consumption function: $C_t = f(Y)$, also named "propensity to consume", which could be expressed as: (i)average propensity to consume, APC, defined by C/Y, and (ii) marginal propensity to consume, MPC, defined by $\Delta C/\Delta Y$, which is symbolized "b".

Therefore, $C_t = C_a + bY$, where: C_t = total consumption, C_a = autonomous consumption when income is equal to zero, and b is MPC (Keynes, 1936).

According to the "Fundamental psychological law of consumption", "men and women are disposed to increase their consumption as their income increases, but not as much as the increase in their income". This means that the additional consumption ΔC is smaller than the additional income, resulting $\Delta C/\Delta Y$ or "b"< 1. In other words, when income increases by one unit, consumption increases by b, as suggested by consumption function [10,11, 22].

Across the time, the connection between income, consumption, wealth was approached and completed in different ways by James Duesenbery's theory on "consumption expenditures and savings" (1949), by Milton Friedman's "theory on permanent income

which sustains that consumption is determined not only by the current income but also by the income expected in future" (1957), by Davidson *et al*. (1978) who analyzed the links between consumers' expenditure and income using econometric modelling of the aggregate time series, by Cuttler (2005) who found "a stable connection between consumption, income and wealth with a long-run marginal propensity to consume", by Hon Tai-Yuen (2016) who used "the co-integration theory to test whether between permanent consumption and income is a long-run equilibrium" [2, 3, 5, 7, 8, 22].

In Romania, important contributions to the study of income, expenses, consumption, GDP were given by various researchers. A long-run bidirectional relationship was found between the expenditure and revenues using "the autoregressive distributive lag approach to co-integration, variance decomposition and rolling regression method" [9]. Household's consumption was estimated based on a macroeconomic model taking into account income, interest rate and the weight of the rural population [4]. The use of the error correction equations revealed that consumption was depressed during the economic crisis as sustained the permanent income theory [21].

The relationship between income, wealth and expenditure in various countries with different development level was study using the logistic, Ferni-Dirac and polynomial distribution [15]. The correlation and regression between household income and expenditures was investigated by [1].

Income and expenditure are important indicators reflecting the living standard of the population and are used to set up the strategic socio-economic policy destined to improve life quality.

In Romania, income is mostly used to cover the fundamental needs of the population. For the expenditures for food consumption per household Romania is on the top with around 26.4% % in total consumption spending compared to 11.1 % the EU-28 average or 7.2 % the lowest level in United kingdom [6].

Between the household income in Romania and other countries there are differences regarding income and expenditure levels determined by employment and its structure, salary policy, labor productivity etc [12].

Of Romania's population, about 44 % is living in the rural area where the average income per household is smaller compared to the urban area and this is due to the fewer opportunities to find jobs and a good salary and for this reason the main activity is still agriculture [16,17,18, 19, 20].

In this context, the purpose of the paper was to analyze the changes, trends and discrepancies between the dynamics of average monthly income per household and average monthly consumption expenditure per household in Romania, and in the rural versus urban area in the period 2007-2017. Also, the study was focused on the dependence of average monthly consumption spending and average monthly consumption expenditures of agro-food products on the average monthly money income per household using linear regression model.

MATERIALS AND METHODS

Data collection.

The empirical data were taken from the National Institute of Statistics for the reference period 2007-2017, and also for comparison were used the data provided by Eurostat Statistics Explained.

The indicators selected to be used in this research have been:

(i)Average monthly income per household, AMI, which has been studied both at the national level, AMI_n, in the urban area, AMI_u, and in the rural area, AMIr;

(ii)The share of the average monthly income per household in the urban area versus rural area in the national level;

(iii)Average monthly consumption expenditures per household, AME, which has been approached both at the country level, AME_n, in the urban area, AME_u, and in the rural area, AMEr;

(iv)The share of the average monthly consumption expenditures in the urban versus the rural area in the national level;

(v)The share of the consumption expenditures in the money income per household;
(vi)Average monthly consumption expenditures on agro-food products and nonalcoholic beverages per households;
(vii)The share of the consumption expenditures on agro-food products in the urban versus the rural area in the national level;
(viii)The share of the average monthly consumption expenditures for agro-food products and non alcoholic beverages per household in the average monthly income per household.

The statistical methods used for processing data have been:

-*Dynamic analysis* based on the use of fixed basis index, which reflects the changes and trends of each indicator in the reference period;

-*Descriptive statistics for each indicator*, including: mean, standard error, median, standard deviation, sample variance, kurtosis, skeweness, minimum, maximum and variation coefficient.

-*Pearson-Bravais correlation coefficients and Sign (2-Tailed)test* to reflect the direction and intensity of the relationship between the expenditures-income pairs of indicators, and also the significance of this connection.

-*The determination coefficients, R square*, were used to show how much of the variation of the dependent variable, Y = expenditures is determined by the variation of the independent variable, X = income.

-*Regression equations* were used to estimate the measure in which the average monthly consumption expenditures will grow for an increase by one unit of the average money income per household both at the national, urban and rural level.

RESULTS AND DISCUSSIONS

Average monthly income per household by residence area

The average monthly income per household in Romania increased by 123.7 % from Lei 1,367.7 in the year 2007 to Lei 3,062 in 2017.
In the urban area, the average monthly income per household raised by 128.6 % from Lei 1,715.3 in 2007 to Lei 3,621.2 in 2017.
In the rural areas, a household earned by 153.1 % more income in average in 2017, when it achieved Lei 2,329.8 compared to Lei 920.4 in 2007 (Fig.1).

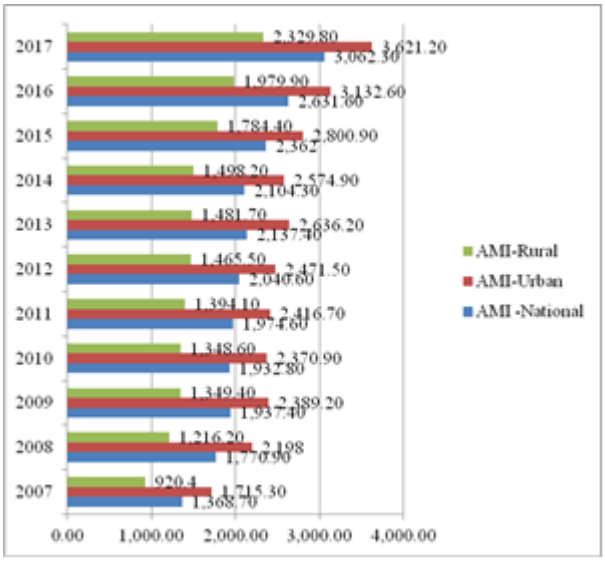


Fig. 1. Dynamics of the average monthly income (AMI) per household by residence area, Romania, 2007-2017 (Lei/household)
Source: Own design based on the data from [14].

Therefore, the average income per household in the rural area registered a more significant growth rate than the income per household in the urban area. But, a household living in the urban area earns more money per month compared to a rural household.
The percentage difference between the average monthly income in the rural versus urban has slightly decreased from - 46.4 % in 2007 to -33.7 % in 2017, which is a positive aspect, reflecting an improvement in the living standard of the rural population.
Compared to the national level of income per household, in the urban area the average monthly income is only by 18.2 % higher in 2017 compared to 25.3 % in the year 2007.
In the rural area, the average income is still below the national average income, but the gap has diminished from -32.8 % in 2007 to -23.9 % in 2017 (Table 1).
Of the total average income in 2017, the highest share accounting for 61.2 % was kept by salaries. On the second position came social benefits which accounted for 21.6 %.

Also, in-kind income, representing the value of self-consumption of own sources recorded 9.7 %.

Table 1. The share of the average monthly urban income per household versus the share of average monthly rural income per household in the national level of the average monthly income per household (%)

	Share in national average monthly income per household in Romania (%)		AMI-Rural/ AMI - Urban (%)
	AMI-Urban	AMI-Rural	
2007	125.3	67.2	53.6
2008	124.1	68.6	55.3
2009	123.3	69.6	56.5
2010	122.7	69.7	56.8
2011	122.4	70.6	57.7
2012	121.1	71.8	59.3
2013	123.3	69.3	56.2
2014	120.3	71.2	58.2
2015	118.6	75.5	63.7
2016	119	75.2	63.2
2017	118.2	76.1	64.3

Source: Own calculations.

Other incomes came from agriculture (2.3 %), independent non-agricultural activities (2.3 %) and household sale assets (1.6%) [13].

In 2017, the money income per person and month, on average, accounted for Lei 1,166, representing 38 % of money income per household.

Also, the average monthly income per person in Romania was Lei 1,290.9, Lei 1,537.44 in the urban area and Lei 1,005 in the rural area, meaning by 35 % less than in the urban area.

Of the total income, money income accounted for 90.3 % at the country level, for 94.7% in the urban area and for 82.5% in the rural area.

Salary is the main income source with a share of 61.2 % at the national level, 69.9 % in case of the people living in the urban area and only 45.7 % for the rural population.

In money income, 6 % is coming from agricultural activities in case of the people living in the rural communities.

In the rural area, the share of social benefits and of the in-kind income is higher compared to the urban area: 24 % and respectively 17.5 % [13].

Average monthly consumption expenditures per household by residence area

The average monthly consumption expenditures per household increased by 184.5 % from Lei 1,104.7 in 2007 to Lei 2,039 in 2017 at the country level.

In the urban area, the level of this indicator raised by 76 % from Lei 1,285.8 in 2007 to Lei 2,263.3 per household in 2017. In the rural area, the growth rate was 100.5 % from Lei 870.4 in 2007 to Lei 1,745.1 in 2017 (Fig.2.).

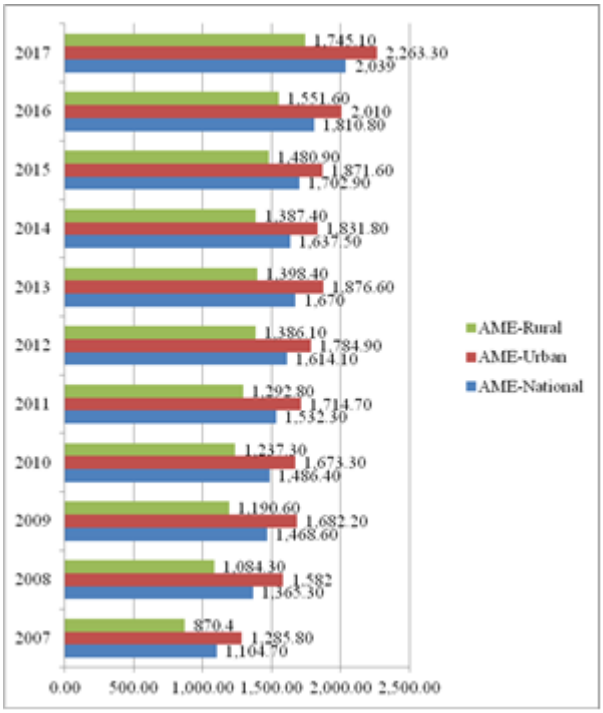


Fig. 2. Dynamics of the average monthly consumption expenditures (AME) per household by residence area, Romania, 2007-2017 (Lei/household)

Source: Own design based on the data from [14].

Therefore, in 2017, in the urban area, the expenditures for consumption are by 11 % higher compared to the level of consumption expenditures per household at the national level compared to 16.4 % in 2007. This aspect reflects that the higher the average income, the higher the average expenditures, but the expenditures increased by a lower growth rate, which explains the tendency to savings of the households earning a higher income and confirms the permanent income theory issued by Friedman (1957).

In the rural areas, the average consumption expenditures are lower than the national level by -14.4 % in 2017 compared to -21.2 % in 2007, as a result of the higher growth rate in the rural areas compared to the national growth.

If we divide the average consumption expenditures per household in the rural areas by the level of this indicator in the urban area, we may notice that the discrepancy between these two levels has been diminished, so that in 2017, a rural household spent by -23.9 % less for consumption than an urban household compared to -32.4 % in 2007 (Table 2).

Table 2. The share of the average monthly urban consumption expenditures versus the share of average monthly rural consumption expenditures per household in the national level of the average monthly consumption expenditures per household (%)

	Share in national average monthly consumption expenditures per household in Romania (%)		AME-Rural/ AME - Urban (%)
	AME-Urban	AME-Rural	
2007	116.4	78.8	67.6
2008	115.9	79.4	68.5
2009	114.5	81.1	70.8
2010	112.6	83.2	73.9
2011	111.9	84.4	75.3
2012	110.6	85.8	77.6
2013	112.4	83.7	74.5
2014	111.9	84.7	75.7
2015	109.9	86.9	79.1
2016	111.0	85.7	77.2
2017	111.0	85.6	77.1

Source: Own calculations.

In general, households spend money for purchasing food and non-food goods, to pay services and obligations to the public and private administration (taxes, contributions, dues etc) and in the rural areas, there are also payments on forages, labor force, seeds, fertilizers, veterinary services etc.

Of the total average expenditure per household, the highest share, 71 %, is represented by consumption expenditures, 21.1 % belongs to taxes and other contributions etc, 3.8 % other spending, 3.6 % production expenditure and 0.5 % expenditure on investments.

In 2017, the average expenditure per person and month was Lei 1,093,92 in Romania. in the rural area, it accounted for Lei 861.84, being by 32.06 % lower than in the urban area (Lei 1,284.58).

The share of money expenditure in the total average monthly expenditure per person accounted for 90.2 % at the country level, for 95.5% in the urban area and for 81.1 % in the rural area.

Of the average money expenditure, the weight of the consumption expenditure was 64.1% at Romania's level, 66.8% in the cities and 59.5 % in the rural communities [13].

The share of the average monthly consumption expenditures per household in the average monthly income per household

At the national level, it was noticed a general decreasing trend from 80.7 % in 2007 to 66.5 % in 2017, reflecting that the income growth led to the increase of the consumption expenditures, but also to savings.

In the urban area, it was observed the same tendency of decline, but from 74.9 % in 2007 to 62.5% in 2017.

Therefore, in the urban area, where the average income is higher, the average consumption expenditures have increased, but the income level also allowed to accumulate savings.

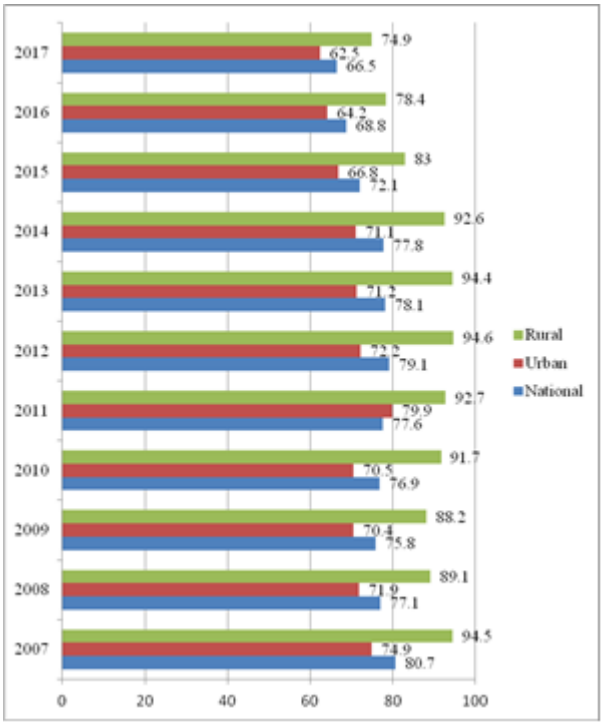


Fig. 3. Dynamics of the share of the average monthly consumption expenditures per household in the average monthly income per household (%)
Source: Own calculation.

In the rural area, the share of average consumption expenditures in the average income per household is the highest because the level of the needs is higher than in the

urban area, but the average income level per household is lower than the one in the urban area and at the country level. But, even in this case, there is a decreasing tendency of the share of the consumption expenditures in the average income level from 94.5 % in 2007 to 74.9 % in 2017 (Fig.3).

Average monthly consumption expenditures for agro-food products and non-alcoholic beverages per households

At the national level, the average monthly consumption expenditures for agro-food products increased by 51.7 % from Lei 460.9 in 2007 to Lei 699.6 in 2017.

In the urban area, the growth rate in the analyzed period accounted for 48 % from the level of Lei 484.4 per household in 2007 to Lei 717.3 in 2017. The value of the consumption expenditures for agro-food products was higher than at the national level.

Fig. 4. Dynamics of the average monthly consumption expenditures for agro-food products, Romania, 2007-2017 (Lei/household)

Source: Own design based on the data from [14].

But the weight of the expenditures in the urban area in the average expenditures at the national level registered a decline from 105.1 % in 2007 to 102.5 % in 2017, which reflects that the expenditures for consumption of agro-food products have increased in a lower rhythm than the average rhythm at the national level (Fig.4).

In the rural area, the average expenditures for agro-food products recorded the highest growth rate in the studied interval: +57.2 % from Lei 430.5 in 2007 to Lei 676.6 per household in 2017. But, the level of these expenditures is lower than the national level and especially compared to the level registered in the urban area.

The ratio between the average consumption expenditures for agro-food products in the rural area versus urban area also reflects the same aspect, as long as the value of the ratio is below 100 %. However, it was noticed a general increasing trend from 88.8 % in 2007 to 94.3 % in 2017, which shows that in the rural area the growth rate of the average consumption expenditures for agro-food products was higher than in the urban area (Table 3).

Table 3. The share of the average monthly urban consumption expenditures for agro-food products versus the share of average monthly rural consumption expenditures for agro-food products per household in the national level of the average monthly consumption expenditures for agro-food products per household (%)

	Share in national average monthly expenditures for agro-food products in Romania (%)		AMEAFP-Rural/ AMEAFP-Urban (%)
	AMEAFP-Urban	AMEAFP-Rural	
2007	105.1	93.4	88.8
2008	105.9	92.4	87.3
2009	104.8	97.7	89.4
2010	103.4	95.3	92.1
2011	102.5	96.7	94.4
2012	101.0	98.6	97.5
2013	102.7	96.4	93.7
2014	102.5	96.8	94.4
2015	101.9	97.4	95.6
2016	102.2	97.1	95.0
2017	102.5	96.7	94.3

Source: Own calculations.

In 2017, of the average consumption expenditure, food and beverages represented 20.1 % at the national level, 20.9 % in the urban area and 18.8 % in the rural communities.

Of the total consumption expenditures, the purchase for non-food products was higher than for food products and beverages: 25.6 %

at the level of Romania, 25.2 % in the cities and 26.3 % in the rural localities.

Of money expenditures, the equivalent of agro-food self-consumption is 18.9 % in the rural area, the highest level compared to only 4.5 % in the urban area [13].

The share of the average monthly consumption expenditures for agro-food products and non alcoholic beverages per household in the average monthly income per household

At the national level, the share the consumption expenditures for agro-food products in the average income per household declined by 33.6 % in 2007 to 22.8 % in 2017. In the urban area, this share has a lower level than at the country level and registered a similar decreasing trend from 28.2 % in 2007 to 19.8 % in 2017.

This reduction of the weight is explained by the fact that the higher the incomes, the lower the share of the expenditures for agro-food products. More than this, it could be possible as in the urban area people to consume less agro-food products and non alcoholic beverages taking into account the lower physical effort for the urban jobs compared to the activities in the countryside.

Table 4. The share of the average monthly consumption expenditures for agro-food products and non alcoholic beverages per household in the average monthly income per household (%)

	National level (%)	Urban level (%)	Rural level (%)
2007	33.6	28.2	46.8
2008	31.5	26.9	42.4
2009	31	26.3	41.7
2010	31.4	26.5	43.0
2011	32.3	27.1	44.4
2012	33.2	27.7	45.5
2013	32.4	27.0	45.0
2014	31.3	26.0	42.3
2015	27.5	23.7	35.5
2016	24.8	21.3	32.0
2017	22.8	19.8	29.0

Source: Own calculations.

In the rural area, the share of the expenditures for agro-food products in the average income per household has the highest share both versus the national level and the urban level. But, it has a general decreasing tendency from 46.8% in 2007 to 29 % in 2017.

This declining trend of the share of the consumption expenditures for agro-food products reflects a higher growth rate of the income compared to the growth rate of consumption expenditures (Table 4).

Household consumption expenditures in Romania compared to other EU countries

Household expenditures could be expressed as a percentage of GDP as well in order to allow comparison among various countries.

In the EU-28 the total expenditures per household represented 54.4% of GDP in 2017. At the EU level, food and non alcoholic beverages represent 12.2 % of household expenditure and alcoholic beverages, tobacco and narcotics 3.8 %.

Regarding the share of household expenditure in GDP, Romania came on the 8th position in 2017, for 61.1 % after the countries with the highest share: Cyprus 76.4 %, Greece 73 %, Portugal 68.3 %, Bulgaria 64.1 %, Lithuania 62.9 %, United Kingdom 62.4 %, and Italy 61.4 %. The countries with the lowest share of household expenditure in GDP were Ireland 30.3 % and Luxembourg 34.3 %.

Concerning the weight of the household expenditure on food and non alcoholic beverages in GDP, Romania came on the top position, having the highest share 17 %, being followed by Lithuania 13.6 %, Greece 12.4 %, Bulgaria 12.3 %, Portugal 11.4 %, Latvia 10.6 % and Cyprus 10.5 %. The country with the lowest share of expenditures on this category of products in GDP is Ireland, 2.8 %, followed by Luxembourg 3.1 %, Netherlands 5 %, Austria 5.1 5, United Kingdom 5.1 %, Sweden 5.4 %, Germany 2.3 % and Denmark 5.2 %.

If we consider, the share of the expenditures for alcoholic beverages, tobacco and narcotics in GDP, on the top position is Latvia with 4.7 %, followed by Cyprus 4.3 %, Estonia 4.1 %,Czech Republic 3.9 %, Lithuania 3.8 %, Hungary 3.7 % and Romania is situated on the 7th position for 3.5 % [6].

Descriptive statistics for the analyzed income and expenditures indicators are presented in Tables 5, 6 and 7.

Table 5. Descriptive statistics for the average monthly income per household at the national level (AMI_n), in the urban area (AMI_u) and in the rural area (AMI_r)

	AMI per household		
	(AMI_n)	(AMI_u)	(AMI_r)
Mean	2,120.2	2,575.2	1,524.3
St. error	134.5	149.3	115.5
Median	2,040.6	2,471.5	1,465.5
St. Dev.	446.1	495.3	383.1
Sample variance	199,093.1	245,339.06	146,804.03
Kurtosis	1.36	1.51	1.04
Skeweness	0/68	0.62	0.81
Min.	1,368.7	1,715.3	920.4
Max.	3,062.3	3,621.2	2,329.8
Count	11	11	11
Var. coef. (%)	21.04	19.23	25.13

Source: Own calculations.

Table 6. Descriptive statistics for the average monthly consumption expenditures per household at the national level (AME_n), in the urban area (AME_u) and in the rural area (AME_r)

	AMEs per household		
	(AME_n)	(AME_u)	(AME_r)
Mean	1,584.6	1,779.6	1,329.5
St. error	73.0	74.8	71.1
Median	1,1614.1	1,784.9	1,386.1
St. Dev.	242.2	248.1	235.8
Sample variance	58,683.3	61,555.8	55,631.3
Kurtosis	1.21	1.58	0.65
Skeweness	-0.13	-0.02	-0.26
Min.	164.7	1,285.8	870.4
Max.	2,039	2,263.3	1,745.1
Count	11	11	11
Var. coef. (%)	15.28	13.94	17.73

Source: Own calculations.

Table 7. Descriptive statistics for the average monthly consumption expenditures per household for agro-food products at the national level ($AMEAFP_n$), in the urban area ($AMEAFP_u$) and in the rural area ($AMEAFP_r$)

	AME per household for agro-food products		
	($AMEAFP_n$)	($AMEAFP_u$)	($AMEAFP_r$)
Mean	626.8	645.8	601.9
St. error	20.7	19.5	22.6
Median	650.1	662.7	633.5
St. Dev.	68.9	64.7	74.9
Sample variance	4,750.4	4,192.08	5,623.1
Kurtosis	2.61	3.50	1.58
Skeweness	-1.51	-1.64	-1.35
Min.	460.9	484.4	430.5
Max.	699.6	717.3	676.6
Count	11	11	11
Var. coef. (%)	10.99	10.01	12.44

Source: Own calculations.

The correlation coefficients between the average monthly income per household and the average monthly consumption expenditures per household are shown in Table 8. Their values reflect a strong and positive relationship between all the pairs of variables taken into consideration, and the Sig (2-tailed) test for $\alpha = 0.05$ and df= N-2=11-2=9, proved that the critical r value is 0.602 lower than r calculated, therefore all the correlations are significant.

Table 8. The correlation coefficients between the average monthly income per household and the average monthly consumption expenditures per household

Indicators	**r**	**Significance**
AMI_n - AME_n	0.976	***
AMI_u - AME_u	0.984	***
AMI_r - AME_r	0.957	***
AMI_n - $AMEAFP_n$	0.778	***
AMI_u - $AMEAFP_u$	0.795	***
AMI_r - $AMEAFP_r$	0.745	***

Source: Own calculations.

The results regarding regression analysis between the dependent factor Y= average monthly consumption expenditures per household and the independent factor X= average monthly income per household are presented in Table 9,10,11,12,13 and 14.

According to the data from Table 9, the determination coefficient R-square = 0.952 reflects that 95.2 % of the variation of AME_n is caused by the variation of AMI_n, therefore it is a strong dependence between the two analyzed indicators.

More than this, the regression equation: $Y= bX +a$ or $AME_n = 0.5299\ AMI_n + 461.04$, tells us that if AMI_n increases by one unit, AME_n will grow by 0.5299 units.

The data from Table 10 show that R-square = 0.969 tells us that 96.9 % of the variation of AME_u is caused by the variation of AMI_u, therefore the two variables are strongly correlated.

The regression function: $Y= bX +a$ or $AME_u = 0.493\ AMI_u + 509.81$ shows that if AMI_u will grow by one unit, AME_u will raise 0.493 units.

According to the data from Table 11, the R-square value = 0.917 shows that 91.7 % of the variation of AME_r is caused by the variation of AMI_r, and in consequence, we identified a strong dependence relationship between these two variables.

The regression function: $Y= bX +a$ or $AME_r = 0.5896\ AMI_r + 430.68$ could be interpreted as follows: an increase by one unit of AMI_r will lead to an increase by 0.5896 units of AME_u.

Table 9. The regression analysis between average monthly consumption expenditures per household (AME_n) and average monthly income per household (AMI_n) at the national level

Regression analysis between Y = AME_n and X= AMI_n					
R-square	0.952				
Adjusted R-square	0.947				
Std. Err. of regression	55.43				
Observations	11				
Sum squared residuals	27,656.5				
F-stat	181.96				
Sign. F	2.83407	Coefficient	Std. Err.	t-Stat	p-value
Intercept (a)		461.04	84.95	5.426	0.000418
X var 1 (b)		0.5299	0.039	13.48	2.83407

Source: Own calculations.

Table 10. The regression analysis between average monthly consumption expenditures per household (AME_u) and average monthly income per household (AMI_u) at the urban level

Regression analysis between Y = AME_n and X= AMI_n					
R-square	0.969				
Adjusted R-square	0.965				
Std. Err. of regression	45.97				
Observations	11				
Sum squared residuals	19,024.46				
F-stat	282.20				
Sign. F	4.208	Coefficient	Std. Err.	t-Stat	p-value
Intercept (a)		509.81	76.85	6.633	9.5505
X var 1 (b)		0.493	0.029	16.798	4.208

Source: Own calculations.

Table 11. The regression analysis between average monthly consumption expenditures per household (AME_r) and average monthly income per household (AMI_r) at the rural level

Regression analysis between Y = AME_r and X= AMI_r					
R-square	0.917				
Adjusted R-square	0.908				
Std. Err. of regression	71.41				
Observations	11				
Sum squared residuals	45,898.05				
F-stat	100.08				
Sign. F	3.5706	Coefficient	Std. Err.	t-Stat	p-value
Intercept (a)		430.687	92.39	4.661	0.00111
X var 1 (b)		0.5896	0.0589	10.004	3.5706

Source: Own calculations.

Table 12. The regression analysis between average monthly consumption expenditures per household for agro-food products ($AMEAFP_n$) and average monthly income per household (AMI_n) at the national level

Regression analysis between Y = $AMEAFP_n$ and X= AMI_n					
R-square	0.605				
Adjusted R-square	0.562				
Std. Err. of regression	45.61				
Observations	11				
Sum squared residuals	18,723.93				
F-stat	13.834				
Sign. F	0.004725	Coefficient	Std. Err.	t-Stat	p-value
Intercept (a)		371.886	69.90	5.3199	0.000481
X var 1 (b)		0.1202	0.032	3.7194	0.004775

Source: Own calculations.

The data from Table 12 show that the R-square value = 0.605, which means that 60.5 % of the variation of $AMEAFP_n$ is influenced by the variation of AMI_n, and in consequence we could conclude that there is a strong dependence between the two indicators.

The regression function: Y= bX +a or $AMEAFP_n = 0.1202\ AMI_n + 371.886$ tells us that an increase by one unit of $AMIAFP_n$ will determine an increase by 0.1202 units of $AMEAFP_n$.

The data from Table 13 reflects that the R-square = 0.632, meaning that that 63.2 % of the variation of $AMEAFP_u$ is the result of the variation of AMI_u, and this proves the existence of a high dependence between the two indicators.

The regression function: Y= bX +a or $AMEAFP_u = 0.1039\ AMI_u + 378.091$ reflects that an increase by one unit of $AMIAFP_u$ will determine an increase by 0.1039 units of $AMEAFP_u$.

Table 13. The regression analysis between average monthly consumption expenditures per household for agro-food products ($AMEAFP_U$) and average monthly income per household (AMI_U) at the urban level

Regression analysis between Y = $AMEAFP_u$ and X= AMI_u					
R-square	0.632				
Adjusted R-square	0.591				
Std. Err. of regression	41.36				
Observations	11				
Sum squared residuals	15,398,5				
F-stat	15.501				
Sign. F	0.00342	Coefficient	Std. Err.	t-Stat	p-value
Intercept (a)		378.091	69.14	5.468	0.000396
X var 1 (b)		0.1039	0.026	3.937	0.00342

Source: Own calculations.

The data from Table 14 mention that the R-square = 0.565, pointing put that only 56.5 % of the variation of $AMEAFP_r$ is caused by the variation of AMI_r, the difference of 43.5 % is given by the variation of other factors.

The interpretation of the regression function: Y= bX +a or $AMEAFP_r = 0.1458\ AMI_r + 379.571$ is that if $AMIAFP_r$ will increase by one unit, this will determine an increase by 0.1458 units of $AMEAFP_r$.

Table 14. The regression analysis between average monthly consumption expenditures per household for agro-food products ($AMEAFP_r$) and average monthly income per household (AMI_r) at the rural level

Regression analysis between Y = $AMEAFP_u$ and X= AMI_u					
R-square	0.565				
Adjusted R-square	0.506				
Std. Err. of regression	52.70				
Observations	11				
Sum squared residuals	24,996.58				
F-stat	11.2462				
Sign. F	0.008476	Coefficient	Std. Err.	t-Stat	p-value
Intercept (a)		379.571	68.182	5.567	0.000349
X var 1 (b)		0.1458	0.043	3.353	0.008476

Source: Own calculations.

CONCLUSIONS

The average monthly income and average monthly expenditure per household increased in Romania in the analyzed period, but income growth rate was higher than expenditure increase rate, attesting Keynes and Friedman's theories.

There are differences regarding income and expenditure levels by residence area. In the rural area, average income per household is the lowest one, compared to the national

average and mainly to the urban income. In 2017, it accounted for 64.3 % of the urban income and 76.1 % of the national average income per household.

Salary is the main income source with a share of 61.2 % in the average income and money income per person represent 38% of money income per household.

In the rural areas, social benefits and in-kind income have the highest share in total average income: 24 % and respectively 17.5 %.

The average consumption expenditure has the highest level in case of the households in the urban area, and it exceeds the national average, while the average consumption expenditure in the rural households represents 77.1 % of the urban one and 85.6 % of the national average.

Consumption expenditure represents 71 % of total expenditure, a high percentage reflecting that Romania is a country based on consumption due the low level of income compared to high developed countries.

The expenditure per person is three times lower in the rural area compared to the average in the urban area.

The share of average consumption expenditure in the average money income decreased from 80.7 % in 2007 to 66.5% in 2017, because the income growth rate is higher than the expenditure rate. But, in the rural area, despite that this percentage declined from 84.7 to 74.9 in 2017 is much higher than in the urban area due to the lower income per rural household and person compared to the level in the cities.

The expenditures on agro-food products and nonalcoholic beverages increased in the urban area and even exceeded the national average, while in the rural area they represent 96.7 % of the country average.

In 2017, the share of expenditures on agro-food products and non alcoholic beverages is the highest in the rural area 29 %, 19.8 % in the urban area and 22.8 % at the national level.

Consumption expenditure of Romania's households as percentage of GDP is enough high, accounting for 61.1 %, placing the country on the 8th position in the EU-28. The expenditure for food an nonalcoholic beverage in Romania is 17 %, the highest in the EU, compared to 11.1 % the average of the EU.

The correlation coefficients between income and expenditure per household are positive, high and statistically significant, reflecting the close link between these two variables.

The regression equations attested the strong dependence of expenditure on income in all the analyzed cases.

It was found that an increase by Lei 100 of the average monthly money income per household will determine an increase by Lei 52.9 of the average monthly consumption expenditure per household at the national level, by Lei 49.30 per urban household and by Lei 58.96 per rural household.

Also, an increase by Lei 100 of the average monthly money income per household will determine an increase of the average monthly consumption expenditure on food and non alcoholic beverages per household by Lei 12.02 at the national level, by Lei 10.39 in the urban household and by Lei 14.58 in the rural area.

As a final conclusion, this research proved that, even though in Romania household's income increased, it is still very low compared to other EU countries. This is confirmed by the high share of consumption expenditures and of expenditures on food and non alcoholic beverages.

Therefore, a high part of income is spent to cover the basic needs of the population, and reflects that a new strategy is required to establish a more rationale income for the population in order to improve the living standard and life quality in Romania and to reduce the discrepancies with the other EU countries.

REFERENCES

[1]Anghelache, C., Manole, A., Anghel, M.G., Partachi, I. 2016, Analysis of the correlation between households income and expenditures, Journal „Economica" No.4 (98):88-103.

[2]Cutler, J., 2005, The Relationship between Consumption, Income and Wealth in Hong Kong, Pacific Economic Review, 10(2):217-241.

[3]Davidson, J.E.H., Hendry D.F., Srba, F., Yeo, S., 1978, Econometric modelling of the aggregate time-series relationship between consumers' expenditure and income in the United Kingdom. The Economic Journal, 88(352), 661-692.
[4]Dobrescu, E, 2013, Updating the Romanian economic model. Romanian Journal of Economic Forecasting 16(4):5-31.
[5]Duesenberry, J. S., 1949, Income, Saving and the Theory of Consumer Behaviour. Cambridge: Harvard University Press.
[6]Eurostat Statistics Explained, 2017, Household consumption expenditure by purpose in the European Union, https://ec.europa.eu/eurostat/news/themes-in-the-spotlight/household-expenditure-2017, Accessed on April 29, 2019
[7]Friedman, M., 1957, The Permanent Income Hypothesis, A Theory of the Consumption Function. Princeton University Press.
[8]Hon, T.-Y., 2016, The Relationship Between Consumption and Income, Journal of Economics Library, Vol.3(1):94-99.
[9]Jalil, M.A., Hye, Q.M.A., 2010, Revenue and expenditure Nexus: A case study of Romania, Romanian Journal of Fiscal Policy, Vol.1(10:22-28.
[10]Keynes, J. M., 1936, The General Theory of Employment, Interest and Money. New York: Harcourt Brace Jovanovich. p. 96.
[11] Lindaur, J., 1976, Macroeconomics (3rd Ed.). New York, John Wiley & Sons. pp. 40–43.
[12]Mihailescu, A., 2016, Politica veniturilor in Romania, Revista de Sociologie Romaneasca, https://www.researchgate.net/publication/304988588_Politica_veniturilor_in_Romania_Revista_de_Sociologie_Romaneasca, Accessed on April 29, 2019.
[13]National Institute of Statistics, Press Release Mo.137/June 6th 2018, Household income and expenditure, www.insse.ro/cms/en/content/household-income-and-expenditure-11, Accessed on April 29, 2019.
[14] National Institute of Statistics, Tempo Online, 2019, www.insse.ro, Accessed on April 29, 2019.
[15]Olteanu, E., 2015, Modelling income, wealth and expenditure data by use of Econophisychs. Ph.D.Thesis, Loughborough University.
[16]Popescu, A., 2011, Labor Resource – a restraining factor of Rural Areas Development, International Symposium " Durable Rural Development", UASVM Timisoara, May 20, 2011, Scientific Papers Agricultural Management, Series I, Vol. XIII, Issue 1, p.91-98
[17]Popescu, A., 2013, Considerations on the rural population as a resource of labour force in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 13(3):229-236.
[18] Popescu, A., 2013, Considerations on the main features of the agricultural population in the European Union, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.13, Issue 4/2013, p.213-220
[19]Popescu, A., Grigoras, M.A., 2011, Research concerning Rural versus Urban Population – Present and Prospect, 1^{1th} International Symposium on "Prospects of Agriculture and Rural Areas in the Context of Durable Development", UASVM Bucharest, June 2-3, 2011, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.11, Issue 2/2011, p.157-161.
[20]Popescu, A., Dinu, T.A., Stoian, E., 2018, Demographic and economic changes characterizing the rural population in Romania, International Conference Agriculture for Life, Life for Agriculture, June 7-9, 2018, UASVM Bucharest, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.18, Issue 2/2018, p.333-346
[21]Scutaru, C., Saman, C., Pauna, B, 2015, Te dynamic of household consumption during economic crisis, Procedia Economics and Finance 22;829-827.
[22]Singh, J., 2019, Consumption function of money: meaning and relationship with income/Micro economics, http://www.economicsdiscussion.net/money/consumption-function-of-money-meaning-and-relationship-with-income-micro-economics/731, Accessed on April 29, 2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ENTREPRENEURSHIP IN THE FIELD OF LIFE SCIENCES: THE PERSONAL SKILLS NEEDED TO START AN INNOVATIVE SME

Nicoleta RADU[1,2], Ana Aurelia CHIRVASE[2], Narcisa BABEANU[1], Mihaela BEGEA[3]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Biotechnology Dept. 59 Mărăşti Blvd, District 1, Bucharest, Romania, E-mails: nicolbiotec@yahoo.com, narcisa.babeanu@gmail.com,
[2]National Institute for Chemistry and Petrochemistry, R&D of Bucharest Biotechnology Dept. 202, Splaiul Independentei Street, District 6, Bucharest, Romania, E-mails: nicolbiotec@yahoo.com, achirvase@gmail.com
[3]University Politehnica of Bucharest, Romania, 212, Splaiul Independentei Street, District 6, Bucharest, Romania. Mobile: +40730728694, E-mail: ela_begea@yahoo.com

Corresponding author: nicolbiotec@yahoo.com

Abstract

The way in which an entrepreneur thinks and acts is a defining factor for the viability of a business in the field of life sciences. The skills of the successful entrepreneur, innate and acquired, are an important argument in this process. To evaluate the viability of these concepts in Romania, during 2014-2016, we conducted a survey based on questionnaires, involving 104 people from universities, research institutes and hospitals. They had to answer questions such as how they react when they have difficult tasks to accomplish, in which way the opinions of others are reflected about the decisions they make, if they can have in the same time, two responsibilities, as the Company Manager and as the Project Team Leader, and if they are able to coordinate a project with multi-disciplinary teams. Results obtained showed that 56% of the respondents when faced with difficult tasks are absolutely certain to be able to achieve them, and only 44% of them answered that they can generally solve them. Regarding how other people's views on their own decisions are reflected, 38% of the respondents strongly agreed that the opinions of others persons do not matter when they make a decision. Other 48% answered that are agreed that they take decisions are made without taking account the opinions of others. Only 13% of respondents answered that the own decisions are based on the opinions of those around them. Regarding the ability to do two things at the same time , 74% of the respondents agreed that they could do this and only 18% said that they do not able to make this. Regarding the ability to coordinate the work of multidisciplinary teams, 78% of answers were positively. Here, only 13% of answers were negative. The analysis indicates that the personal skills are important for entrepreneurships. Persons who are passionate about what they are doing, and who have a deeply knowledge in different areas of the life sciences, and which are able to coordinate multidisciplinary teams have greater chances to succeed as entrepreneurs for innovative SME.

Key words**:** *entrepreneurship skills, innovative SME*

INTRODUCTION

There are many studies that try to explain the entrepreneurial success on the basis of individual qualities. In most of these studies, personal qualities such as autonomy, interpersonal relations, capability to manage the environment, personal development, and last but not least the goal in life and self-acceptance [3, 4, 5] seem to be personal qualities. Other concepts explain entrepreneurial intent and success on the basis of volunteer abilities; and the conclusion of these approaches is that in the entrepreneurial

process, the will has a greater influence over the process than the environmental constraints [3]. Statistics have shown that in general the percentages of female entrepreneurs fit with those of male entrepreneurs. At a closer analysis, female entrepreneurs have specific abilities such as: perseverance, sensitivity, empathy. In the case of female entrepreneurs, an important role seems to play the skills of how to deal with people and how to communicate [5].

Other papers say that there is a link between entrepreneurial selectivity and entrepreneurial intent. Thus, the entrepreneur is perceived as a person self-conscious and self-sufficient who wants to do entrepreneurship and their own person 1) is aware that he can do this 2) he knows if he is fitting with what he / she wants to do [4].

MATERIALS AND METHODS

To evaluate the viability of these concepts in Romania, during 2014-2016, we conducted a survey in based on questionnaires, in which were involving 104 people from universities, institutes and hospitals. They had to answer questions such as: how they react when they have difficult tasks to accomplish; in which way the opinions of others are reflected about the decisions they make; if they can have in the same time, two responsibilities, like Company Manager and Project Team Leader, and if they are able to coordinate a project with multi-disciplinary teams. In this part of the questionnaire for their answers, the respondents has use the scale presented in the Table 1 [8, 9, 10, 11].

Table 1. Scale used to quantify the respondents answers

Respondent opinion	Score
strongly agree	1
agree	2
disagree	3
strongly disagree	4
refusal/no answer	5

Source: [8, 9, 10, 11]

RESULTS AND DISCUSSIONS

When the respondents has select a response to the statement, "Generally, when I face difficult tasks, I am sure I will accomplish them" the end results sown that 56% of the respondents said they were totally in agreement, and 44% are agree (Figure 1). Overall, all respondents agreed with this statement, demonstrating that the selected persons are self-determined and autonomous [12]. Regarding the affirmation "My life is determined by my own action, not by other or by chance", the results shown the following: 36% of respondents were strongly agreed; 55% were agreed and 9% disagree (Figure 2).

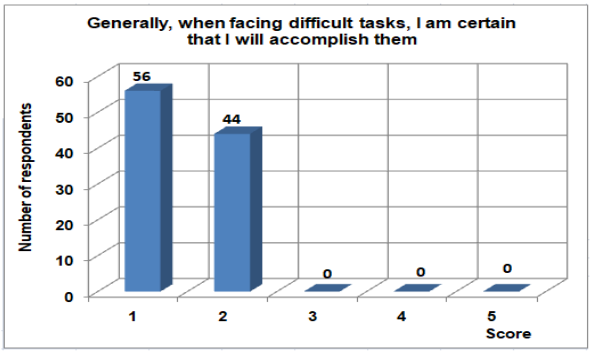


Fig. 1. The respondents' opinion at the statement: "Generally, when I face difficult tasks, I am sure I will accomplish them"
Source: Own calculation.

With a 91% of positive responses, we can see that the selected persons are able to resist social pressure to think and act in some ways. These values prove that the majority of participating at this survey has autonomy. [12].

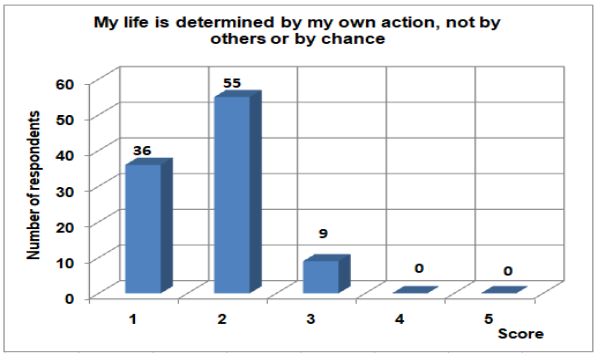


Fig. 2. The respondents' opinion at the statement: "My life is determined by my own action, not by other or by chance"
Source: Own calculation

Regarding "The possibility of being rejected by others for standing up for my decisions

would not stop me" is affirmation, 48% agree, 13% disagree and 1% of respondents has no answer (Figure 3). The total value of 86% of positive answers demonstrates that selected individuals have the skills to manage the external environment, are able to choose and create contexts appropriate to personal needs and needs. The high percentage of responses shows that 86% of respondents to the questionnaire are able to effectively use the opportunities that occur in the environment at one time, being able to create the contexts appropriate to personal needs and values. In fact, these people have the qualities of " Environmental Mastery" [12].

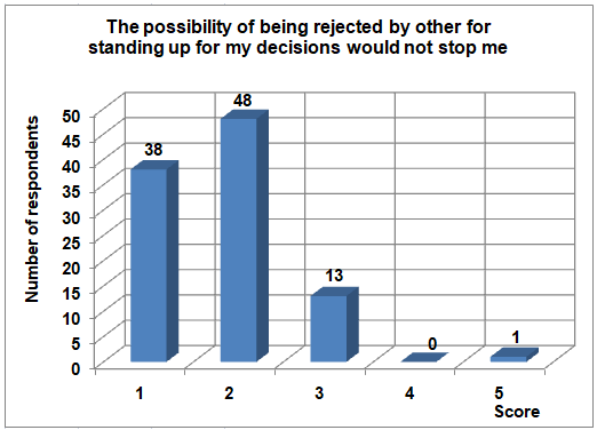


Fig. 3. The respondents' opinion at the statement: "The possibility of being rejected by others for standing up for my decisions would not stop me"
Source: Own calculation.

The answers received at the phrase "I am an inventive person who has ideas" indicate that 43% of respondents strongly agree with this affirmation, 48% agree, 5% disagree and 4% has no answer (Figure 4). Overall, 91% of the respondents agree with this affirmation, demonstrating that the selected persons have creativity and their personality is in continuous development.

The high percentage of affirmative answers shows that 91% of respondents to the questionnaire have specific qualities which indicate the Personal growth and Autonomy [12]. The responses to the affirmation "I am optimistic about my future" show that 43% of respondents are strongly agreed and 48% agree. Only 5% for respondents are not agreeing with this affirmation (Figure 5).

The structure of these answers reveals that 91% for respondents manifest Autonomy, has positive relationships with other and can have the qualities of Environmental Mastery.

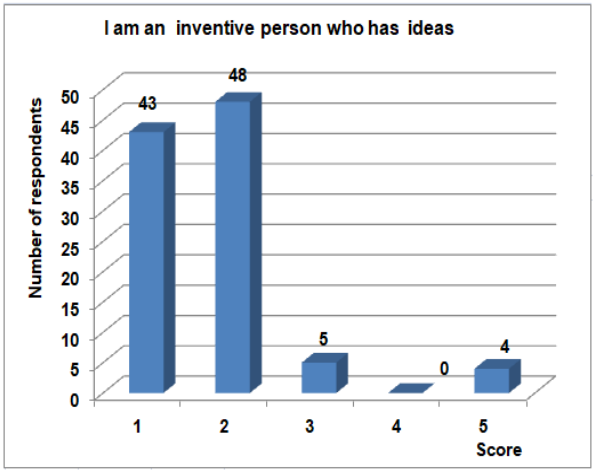


Fig. 4. The respondents' opinion at the statement: "I am an inventive person who has ideas"
Source: Own calculation.

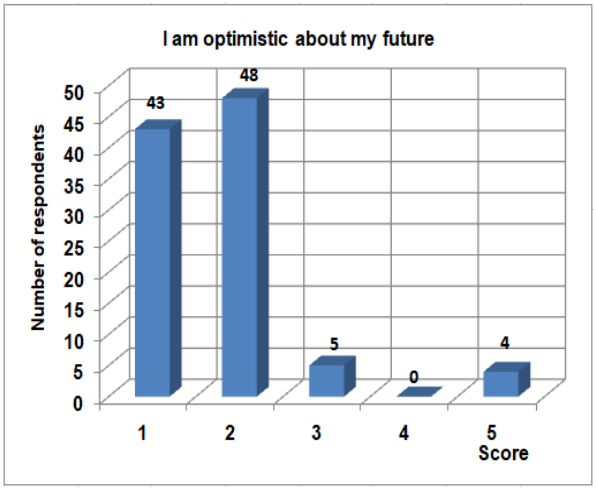


Fig. 5. The respondents' opinion at the statement: "I am optimistic about my future"
Source: Own calculation.

Regarding the affirmation "I'm often appreciated and encouraged by others due to my daring and well-organized ideas and plans", the answers received showed that 21% of respondents strongly agree and 61% agree. Only 8% of respondents are not agreed and 10% has no answer (Figure 6). The total of 82% positive answers indicates that these persons have personal qualities like creativity and passion.

This is confirmed too by the results of a study aimed at explaining entrepreneurial training

and development based on creativity, passion and, ultimately, the personal effectiveness of entrepreneur [2].

The study has shown that entrepreneurial experience increases entrepreneurial efficiency and sustains passion over time. In addition, entrepreneurial training influences the development of business as a result of passion, and for entrepreneurs who are organized, and creative, can aquire Mastery in entrepreneurial activity [2, 6]. The data obtained are in agreement with the results of model tested in Sweden, where in the entrepreneurship process, psychological autonomy mediates the relationship between active engagement and well-being, with positive effects on competences and relationships. This is because when an entrepreneur has qualities such as self-organization and autonomy, then he / she will work better (Personal growth) and will be able to cultivate more meaningful relations with others [13].

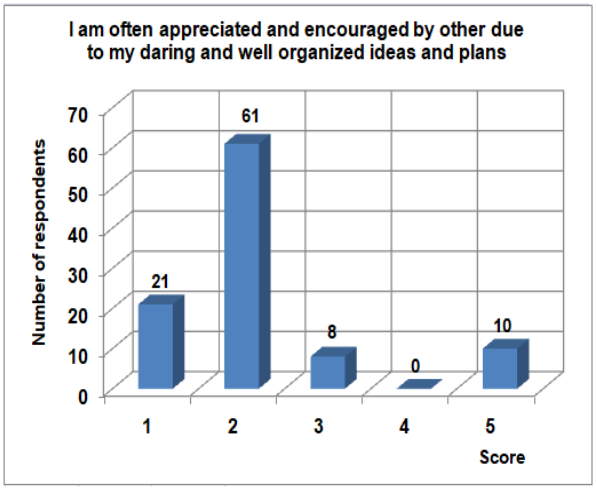


Fig. 6. The respondents' opinion at the statement: I'm often appreciated and encouraged by others due to my daring and well-organized ideas and plans"
Source: Own calculation.

Regarding the respondents choice concerning the statement "I am able to manage well enough a new project and developing a company", the results obtained showed that 21% of these are strongly agree with this fact, 61% agree, 8% are not agree and 10% has no answer (Figure 7).

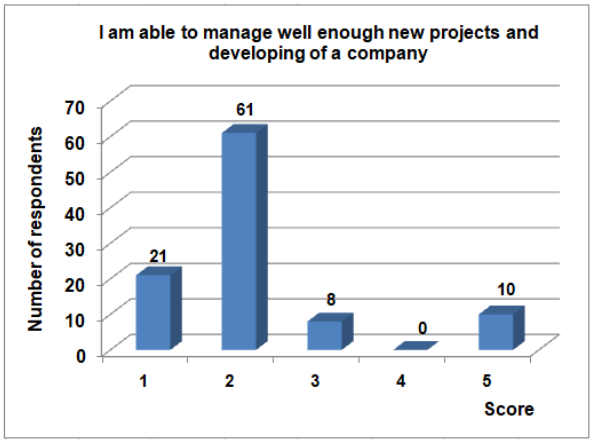


Fig. 7. The respondents' opinion at the statement: "I am able to manage well enough a new project and developing a company"
Source: Own calculation

The total value of 82% for positive answers supports the previous study [2], according to which, in the long run, the passion intensifies, the efficiency grows, and the entrepreneurs acquire mastery in the field of entrepreneurship. With regard to the answers received to affirmation "I am able to lead people with diverse backgrounds, professions or personalities", the results show that 25% of respondents strongly agree, 53% agree, 13% are not agree and 9% of respondents have no answer (Figure 8).

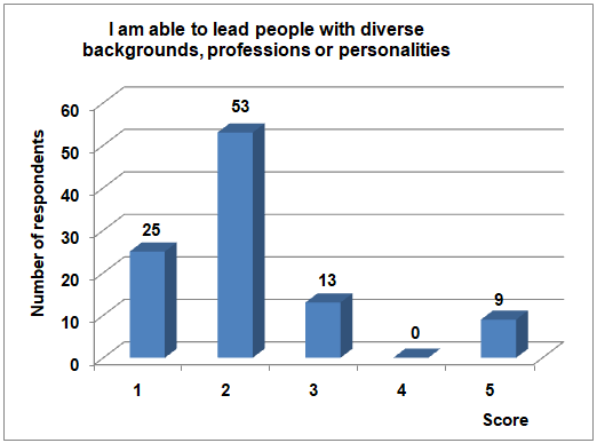


Fig. 8. The respondents' opinion at the statement: "I am able to lead people with diverse backgrounds, professions or personalities",
Source: Own calculation

With a total value of 78%, respondents have proven they can have control over the outside world (environmental mastery) and can bind warm relationships with others (can have a positive relationships with others).

In addition, they are aware that the experience they will gain by working with people with different knowledge, professions, and personalities, can has as the effect the improvement of personal growth [2, 6, 12, 14].

CONCLUSIONS

The results obtained from survey analysis showed that 100% of respondents are self determinate and more that 91% has autonomy. About 90% of respondents said they were inventive persons and 82% of them declare that are creative and passionate; this indicates that at least 82% of respondents are able to create and lead innovative companies.

Between (78-91)% of survey respondents has the qualities of Environmental Mastery, and 82% from these can acquire Mastery in entrepreneurial activity. Is important to notice that 91% of respondents are able to resist to social pressure, and they can think and acting in entrepreneurship process in personal ways, according to own values and interest.

Only 78% of respondents declare that they can lead people with different backgrounds, professions or personalities, and this fact can improve the own personality of entrepreneur.

These results confirm that the skills of the entrepreneur, innate and acquired, are the important factors for business success.

REFERENCES

[1]Fuller, B., Liu, Y., Bajaba, S., Marler, L.E., Pratt, J., 2018, Examining how the personality, self-efficacy, and anticipatory cognitions of potential entrepreneurs shape their entrepreneurial intentions. Personality and Individual Differences, Vol.125:120–125, https://www.sciencedirect.com/science/article/pii/S0191886918300059, Accessed on January, 28, 2019.

[2]Gielnik, M. M., Uy, M. A., Funken, R., Bischoff, K. M., 2017, Boosting and sustaining passion: A long-term perspective on the effects of entrepreneurship training. Journal of Business Venturing, Vol. 32(3): 334–353.

[3]Hikkerova, L., Ilouga, S. N., Sahut, J.M., 2016, The entrepreneurship process and the model of volition Journal of Business Research 69: 1868–1873.

[4]Hsua, D. K., Burmeister-Lamp, K., Simmons, S. A. Foo, M-D., Hong, M.C., Pipes, J.D., 2019, I know I can, but I don't fit: Perceived fit, self-efficacy, and entrepreneurial intention, Journal of Business Venturing, Vol. 34(2):311-326.

[5]Manzanera-Román, S., Brändle, G., 2016,. Abilities and skills as factors explaining the differences in women entrepreneurship. Suma de negocios, Vol 7(15):38-46.

[6]Milanesi, M., 2018, Exploring passion in hobby-related entrepreneurship. Evidence from Italian Cases. Journal of Business Research, 92(C):423–430.

[7]Newman, A., Obschonka, M., Schwarz, S., Cohen, M., Nielsen, I., 2018, Entrepreneurial self-efficacy: a systematic review of the literature on its antecedents and outcomes, and an agenda for future research, Journal of vocational behavior, pp. 1-17, http://dro.deakin.edu.au/view/DU:30109656, Accessed on January, 28, 2019.

[8]Radu, N., Chirvase, A. A., Velea, S., Babeanu, N., Popa, O., Steponaviciene, R., Hastaran, F., 2014, Modern learning system and improved curricula for education management in life sciences, to promote the business enhancement, Agro Life Scientific Journal, Vol.3(1):116-119.

[9] Radu, N., Chirvase, A. A., Babeanu, N., Popa, O., 2015a, Educational management in the field of life sciences - blending learning for bioentrepreneurs training. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.15(2):301-304.

[10]Radu, N., Chirvase, A. A., Babeanu, N, Popa, O., 2015b, Educational Management In The Field Of Life Sciences - Key Competences Needed to Start and Develop the Innovative SME. Scientific Papers Series Management, Economic Engineering in Agriculture And Rural Development Vol. 15(2):297-300.

[11]Radu, N., Chirvase, A. A., Babeanu, N., Popa, O., Hastaran, F., Velykiene, B., Begea, M., 2018, Education Management in the field of life sciences-skills needed to start and develop an Innovative SME. Scientific Papers, Series Management, Economic Engineering In Agriculture and Rural Development, Vol. 18(2):375-381.

[12]Ryff, C. D., 2018, Entrepreneurship and eudaimonic well-being: Five venues for new science, J. of Business Venturing, In Press, https://www.sciencedirect.com/science/article/abs/pii/S0883902617307899, Accessed on January, 28, 2019.

[13]Shir, N., Nikolaev, B.N., Vincent, J., 2018, Entrepreneurship and well-being: The role of psychological autonomy, competence, and relatedness, J. of Business Venturing, In Press, https://www.sciencedirect.com/science/article/pii/S0883902617301672**,** Accessed on January, 28, 2019.

[14]Stroe, S., Wincent, J., Parida, V., 2018, Untangling intense engagement in entrepreneurship: Role overload and obsessive passion in early-stage entrepreneurs. Journal of Business Research, Vol. 90:59-66**.**

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

INFLUENCE OF TEMPERATURE AND TURBIDITY ON CYANOBACTERIAL BLOOMS FROM ARGES RIVER, ROMANIA

Ilie-Daniel RAICU[1,2], Ovidiu POPA[1], Miruna VADUVA[3], Veronica PANAIT[2], Florentina IARIM[2], Oana PAUN[2], Narcisa BABEANU[1]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, Bucharest, Romania, Phone: 00 40 737 282 003, Email: danielilie.raicu@yahoo.ro narcisa.babeanu@gmail.com, ovid_popa@yahoo.com
[2]SCA Laboratory, Apa Nova Bucharest Company, 53 Cartier Crivina Street, Bolintin-Vale, Romania, Email: panaitveronicaionela@gmail.com
[3]The World Bank in Romania, 31 Vasile Lascar St., Bucharest, Romania, Phone: 00 40 755 362 131, Email: vaduva.miruna@gmail.com

Corresponding author: ovid_popa@yahoo.com

Abstract

This article presents the evolution of cyanobacterial abundance represented by Microcystis sp. and Aphanizomenon sp., in the period 2009-2017, on the river Arges, in Romania, as well as correlations with the temperatures and turbidities of water, in order to identify the impact of the actual climatic trends on the frequency and concentration of cyanobacteria. During this time interval it could be observed a change in the cyanobacterial blooming period by its moving in autumn, also the growth of its duration, but in the same time, a slight decrease a cyanovbacteria production during the whole year. The duration of cyanobacterial blooms season was positive correlated (+0.74) with the average annual temperature, and negative correlated (-0.71), with the turbidity in the season. The maximum concentration achieved by cyanobacteria showed negative correlation (-0.62) along with the turbidity recorded at the beginning of the cyanobacterial blooms season. Although temperature is a very important factor in cyanobacterial development in the Arges river, flood-induced turbidity plays a key role both in favoring or inhibiting its growth but also in adjusting temperatures.

Key words**:** *cyanobacterial blooms, temperature, turbidity, correlation*

INTRODUCTION

The development of cyanobacteria in water sources that are suitable for potabilizartion, the high abundance and toxin production has forced international organizations to look out more strictly for this phenomenon [2, 5,6,11,12].
One of the most important factors that influences the growth rate of cyanobacteria is temperature [9,12], its overall trend being constant increase [8]. The impact of climate change on the growth of cyanobacteria in river waters is not yet well studied, with most research being done on lakes and reservoirs [1].
Global warming seems to lead to the enrichment of waters with various nutrients [4,10], which together with high temperatures seem to favor cyanobacterial blooms [13]. A rise in temperature is considered to be beneficial to the development of cyanobacteria due to the vertical stratification of water [3,9,10], while intense rain would lead to increased nutrient concentration, due to the washing of the slopes [10]. Changing climatic conditions, intense drought in alternation with floods may be the cause of cyanobacterial growth [9].
Phytoplankton biomass and some nutrients (nitrogen and phosphorus concentrations) express the degree of eutrophication of aquatic ecosystems [7].

MATERIALS AND METHODS

In order to be able to describe the impact of the latest climate changes on the frequency and abundance of cyanobacteria, the following parameters were monitored for a nine years period: temperature, turbidity, cyanobacterial abundance (*Aphanizomenon*

sp. and *Microcystis* sp.). Samples were taken from Arges river, Bolintin-Vale(B-V) area, having the following geographical coordinates: 44.427871, 25.778887.
The data was provided by SCA Laboratory of Apa Nova Bucharest Company.
The main method of determining correlations between data series was a Pearson correlation coefficient with the following standard formula:

$$r = \frac{\sum_{i=1}^{n}\left((x_i - \bar{x})(y_i - \bar{y})\right)}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

RESULTS AND DISCUSSIONS

The presence of *Aphanizomenon* sp. and *Microcystis* sp. was registered in the medium with an average of 92 days per year, except 2014, a year without cyanobacterial bloom. However, the general trend is one of growth (Fig.1), the highest values of the last nine years being recorded in 2017, with a 131-day season.

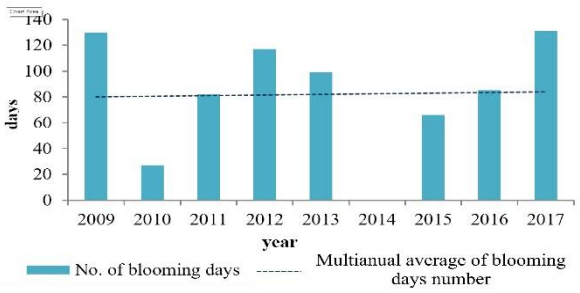


Fig.1. No. of days with cyanobacteria blooms, between 2009 – 2017, in Arges, B-V.
Source:SCA Laboratory database, Apa Nova Bucharest Company.

There is a strong positive correlation (0.74) between the extent of cyanobacterial season and the annual average temperature (Fig.2), but a moderate positive one with the temperature at the end of the mentioned season. The increase of the average water temperature resulted in an increase of the cyanobacteria blooms season. These correlation indicates that temperature is one of the most important factors that are influencing the growth of cyanobacterial populations in the Arges river.

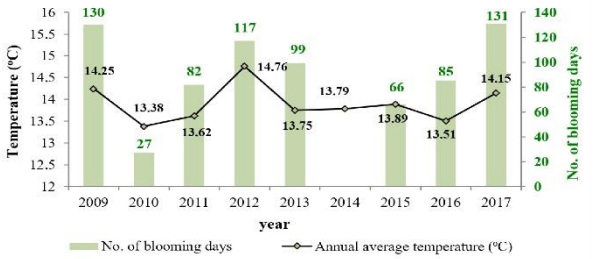


Fig.2. Number of days of cyanobacterial blooms and annual average temperature, Arges B-V, 2009-2017.
Source:SCA Laboratory database, Apa Nova Bucharest Company.

The average turbidity recorded during the cyanobacterial blooms season is 94.42 NTU, and the recorded peak is 50.91 NTU. The number of days recorded with cyanobacterial blooms is directly influenced by the level of turbidity of river water during the cyanobacterial blooms season. Thus, a strong negative correlation was obtained with the turbidity recorded during the season (-0.71), with the average annual turbidity (-0.69), with the turbidity at maximum cyanobacterial blooms period (-0.64), and the turbidity at the end of the season (-0.64).
Studying the connection between the length of blooms season with the average values of the cyanobacterial abundances (Fig.3) we obtained a positive correlation (+0.52), which is not a strong one due to the peak periods of the blooms, which maximum have a great influence on the average abundances.
The maximum cyanobacterial abundance shows a negative correlation (-0.44) to the length of the season cyanobacteria, consequently a greater richesse of cyanobacterial bloom will result in the shorter period of the season. Correlation tells us that strong blooms can consume some of the nutrients, diminishing conditions favorable to continued cyanobacterial blooms.
The correlation between maximum abundance and minimum temperature in the cyanobacterial season was +0.63. It was observed a slightly negative correlation (-0.62) between the maximum titre of cyanobacteria and the turbidity at the start of the cyanobacteria blooming period (Fig.4). One conclusion could be: the higher will be the turbidity at the beginning of the season,

the lower will be the maximum value of the concentration that year.

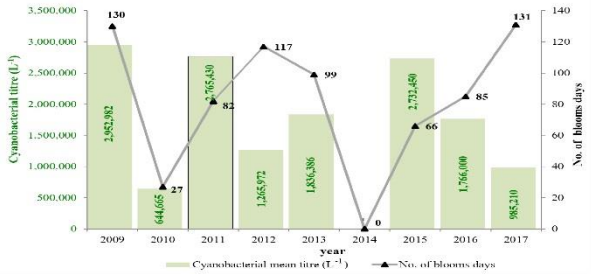


Fig. 3. The evolution of mean titre of cyanobacteria and the length of cyanobacterial blooms, in Arges river, B-V, between 2009-2017.
Source:SCA Laboratory database, Apa Nova Bucharest Company.

There is a positive correlation between cyanobacteria production, (titre × duration of cyanobacterial blooms season) and the turbidity values at the start of the cyanobacterial blooms season (+0.53). At the end of the mentioned period, cyanobacteria production was negatively correlated with NTU values. Production is also correlated positively with the temperature at maximum of cyanobacterial bloom (0.44) and the temperature at end of cyanobacterial bloom (0.41).

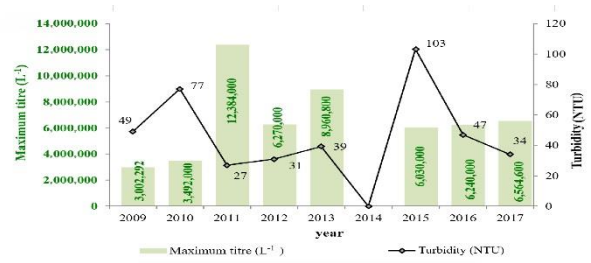


Fig. 4. Turbidity levels and cyanobacterial abundance registered in Arges river, B-V, between 2009-2017.
Source:SCA Laboratory database, Apa Nova Bucharest Company.

In the Arges river cyanobacterial blooms starts between June 5 to July 27, with a migration trend towards mid-July.
The peak of the cyanobacteria titre was in the period July 10 - September 26, with a migration trend from June, as recorded in the first four years (2009-2012) towards the end of September, as seen during 2013-2017 period. In 2014 there were no cyanobacterial blooms (Fig.5).

The end period of cyanobacterial blooms respects the general trend, migrating between 5 and 13 days towards the end of October, from 11,12 October in 2009, 2010, on 17, 25 October 2016 and 2017.

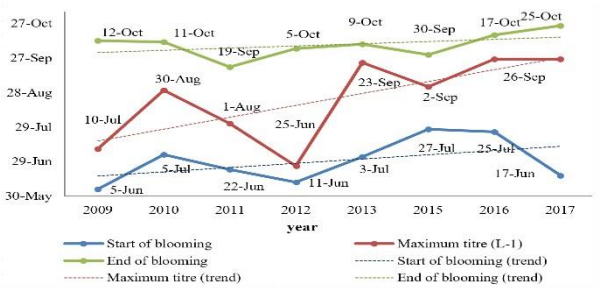


Fig. 5. Start, peak and end blooms values for cyanobacteria, registered in Arges river, B-V, in 2009-2017 period.
Source:SCA Laboratory database, Apa Nova Bucharest Company.

The general trends of cyanobacterial bloom migration are a result of changes in temperatures and the rainfall regime of turbidity.
During cyanobacterial blooms periods we obtained a multiannual average temperature of 22.21 °C; 24.61 °C values were recorded at the beginning of the season, respectively 27.66 °C at the peak of season. The start and maximum values of temperatures are recorded in the optimal growth range of cyanobacteria in temperate zones, described by Reynolds (2006) [10], ranging from 25 to 35 ° C.
In general, the end of the cyanobacterial blooms season is characterized by a low persistence of Microcystis caused by low temperatures, the multiannual minimum temperature being of 15,18 °C.

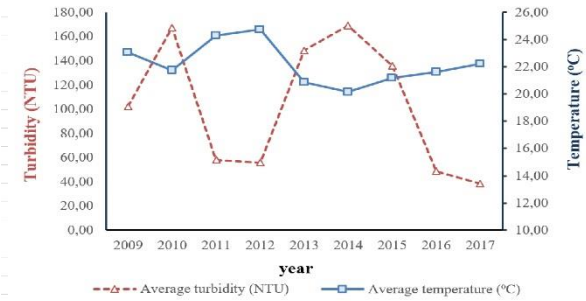


Fig. 6. The evolution of temperature and turbidity levels recorded in the cyanobacterial blooms seasons, between 2009-2017, Arges river, B-V.
Source:SCA Laboratory database, Apa Nova Bucharest Company.

Analyzing the correlations between temperature and turbidity values, we obtained the following strong correlation indices: -0.67 between the average values and -0.79 between the maximum values. This is explained by the marked tendency of temperature drops with increasing turbidity in water (Fig.6 and Fig.7).

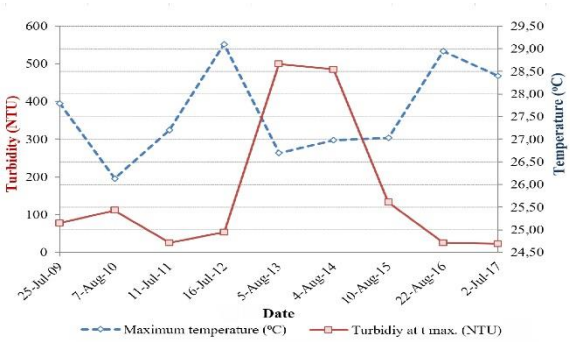


Fig. 7. The evolution of maximum temperature and turbidity between 2000-2017, Arges river, B-V.
Source:SCA Laboratory database, Apa Nova Bucharest Company.

CONCLUSIONS

The analysis of the recordings made on the Arges river, during 2009–2017 period, it was observed that the cyanobacterial blooms season tends to migrate to the autumn and its dimensions tend to extend to 131 days.

The annual number of days in which Cyanobacteria is present in the Arges river is strongly correlated (0.74) with the average annual temperature.

Turbidity has an important role in the starting process, maintaining, and reaching high levels of cyanobacterial, thus showing a strong negative correlation (-0.71) with the number of bloom days. This strong correlation can lead us to the conclusion that a warming of the environment can result to a direct incensement of the number of days with cyanobacterial blooms.

The increase in turbidity also negatively influences the water temperature, and between these parameters a strong negative correlation (-0.79) is established.

Temperature is one of the most important factors influencing the development of cyanobacterial populations in the Arges river (B-V) and turbidity plays a key role both in favoring or inhibiting the growth of *Microcystis* and *Aphanizomenon* populations and in adjusting Arges river temperature.

REFERENCES

[1]Bussi, G., Whitehead, P.H., Bowes, M.J., Read, D.S., Prudhomme, C., Dadson, S.J., 2016, Impacts of climate change, land-use change and phosphorus reduction on phytoplankton in River Thames(UK) Science of the Total Environment 572(2016) 1507-1519.

[2]Chorus, I., Bartram, J., 1999, Toxic Cyanobacteria in Water, F&FN Spot, London, 416pp.

[3]Dokulil, M.T., Teubner, K., 2000, Cyanobacterial dominance in lake. Hydrobiologia 438(1), 1-12.

[4]Elliot A., 2012, Is the future blue-green? A review of the current model predictions of how climate change could affect pelagic freshwater cyanobacteria. Water Research 46, 1364-1371.

[5]EPA, 2015, Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water. Office of Water (4606M) EPA 815-R-15-010. USA.

[6]IPCC, 2014, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland.

[7]Neagu, C., 2013. Sources of eutrophication of the waters in Calarasi county, Scientific Papers Series Management. Economic Engineering in Agriculture and Rural Development Vol. 13(1):257-262.

[8] NOAA, NASSA, 2017. Annual Global Analysis for 2016.

[9]Paerl, H.W., Huisman, J., 2008, Blooms like it hot. Science 320:57-58.

[10]Paerl, H.W., Hall, N.S., Calandrino E. S., 2011, Controlling harmful cyanobacterial blooms in a world experiencing anthropogenic and climatic-induced change. Science of the total environment 409(10): 1739-1745.

[11]Reynolds, C.S., 2006, Ecology of Phytoplankton. Cambridge University Press. New York. Sarnelle, O. and Wilson, A.E. 2005. Local adaptations of Daphnia pulicaria to toxic cyanobacteria. Limnology and Oceanography. 50(5): 1565-1570.

[12]World Health Organization, 2014, Management of cyanobacteria in drinking-water supplies: Information for regulators and water suppliers. WHO/FWC/WSH.

[13]Zhang, M., Duan, H., Shi, X., Yu, Y., Kong, F., 2012, Contribution of meteorology to the phenology of cyanobacteria blooms: Implications for future climate change Water research 46, 442-452.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

INVESTIGATION ON THE MOTIVATION OF RURAL PEOPLE TO PARTICIPATE IN WATERSHED MANAGEMENT PROJECTS

Soleiman RASOULIAZAR, Saeid FEALY-NAHAVAND

Islamic Azad University, Department of Agricultural Management, Mahabad Branch, Mahabad, Iran. Phone: +984442338428, Fax:+ 984442333000, Mobile:+9149442158, Emails: rasouli88s@yahoo.com, saeid.fealy.58@gmail.com

Corresponding author: rasouli88s@yahoo.com

Abstract

The main purpose of this study was to investigate the motivation of rural people to participate in watershed management projects in Mahabad Township. A field survey based on a questionnaire was used as the main instrument in this research. The validity of questionnaire was confirmed by the panel of specialist group of academic member and natural resources experts. The population included in this study consisted of people who lived in Mahabad's dam catchment. By Cochran's formula 175 people were determined as sample size. The results showed that rural people has an economic and social motivation to participate in watershed management projects. Also the results show that the sharing of income and benefits from watershed management was the most important economic motivation priority and religious belief about doing things by participating for the most important social motivation priority. In this research also the finding shows that a large variety of information sources must be used about watershed design and educational programs related to watershed management from TV and talking to propagators or natural resource experts in the village about watershed design were the important resource to increase awareness of rural people about watershed management.

Key words**:** *motivation, participation, watershed management, Mahabad*

INTRODUCTION

Management of water supply and development has been formed as a dynamic and effective factor in policy making, planning and creating the necessary resources for utilizing water resources from a number of years ago [28]. Currently, nearly 94% of the water consumed by the country is devoted to agriculture. Low productivity of agricultural production has reduced water productivity in agricultural sector. While increasing the productivity of water use in agricultural lands plays an important role in food survival and security [13].

Accordingly, attention to increasing productivity and improving agricultural productivity has become inevitable. A sustainable agricultural system should meet the needs of the present generation without compromising the needs of the next generation [2].

Natural resources are the basis for life and sustainable development of the country and the backing of the agricultural sector. The role of natural resources in the production and maintenance of soil, food supply, oxygen production, and air purity are quite clear. Regarding the concepts of sustainable development, natural resources are not our past heritage, but the lending of future generations. Which must be preserved, developed and exploited [21].The three problems have made water resource constraints one of the biggest problems in the country: such as annual rainfall shortages, rising evapotranspiration and unsustainable rain distribution. In recent years, water problems have caused irreparable damage on the natural resources and financial resources to farmers.

The Minister of Agriculture Jihad said: We need to manage more groundwater aquifers. We store water in the tables. Increase vegetation cover. Prevent evaporation of excess water. The most vital task is to feed groundwater aquifers. The best way to manage water resources is through methods such as aquaculture and flood spreading. In recent years, the excessive withdrawal of

groundwater has disturbed the balance of the tables, so that water consumption has always been more than water supply in the aquifers [15]. In Iran due to inappropriate exploitation and excessive water resources, there are serious challenges in providing agricultural water. This problem faces the agricultural sector with various challenges [10, 11].The economic growth and development of the country, especially the agricultural sector, depends on renewable natural resources such as forests, pastures, water and land [1].Iran has an area of more than 164 million hectares, of which 12.4 million hectares of forest land, 90 million hectares of pasture, 43.2 million hectares of desert and desert, and about 18.4 million hectares of arable land and gardens. It is worth noting that only 3.9 million hectares are classified among the rangelands of Iran's entire rangelands [28 ,11].

Watershed is concerned as one of the most important actions has primary role to the management of land, water and vegetation resources, optimal operation of resources and the protection of fundamental wealth [30]. Watershed management could be correctly managed our life situation [12].The watershed can be recognized to the operation of water and soil resources to enhance agricultural production [33] and enhance soil moisture levels [31], control of soil erosion [18]. Watershed management can employments in rural area [29], increase and maintenance the groundwater levels [32], and decrease the migration of rural people [33].

Watershed management projects depending on the success of rural people participation in decision-making, implementation and maintenance of projects. When Rural People's has participated in projects like watershed management caused to increases the successful projects rate [23].

Mahabad Dam Lake is one of the important sources of drinking water supply for citizens and farmers due to soil erosion, rangeland degradation and unplanned plowing in the course of 40 years from 230 million cubic meters to 180 million cubic meters, so that about 50 million tons of sediment in the lake has lived. In addition to the severe erosion of the soil and the reduction of the useful life of the dam, this will be irreparable damage to the region's economy, especially the agricultural products of the Mahabad and the supply water to the people [28].

Considering the mountainous nature of this region, the waters caused by the ascents cause floods in these areas, as this year some parts of the villages of Abdullah-Korde, Achi-Dareh, Ozan-Dareh, Ile-Timur, Oznatosh, Ghale-Jogheh and Haji Mamyan in the watershed They suffered a lot. Pirebabi the head of the agricultural extension service center that located in the watershed catchment area poses some of these problems to unnecessary use and degradation of pastures, misuse and early misuse of livestock and unskillful encounters with nature. Therefore, in recent years, several watershed management plans have been biologically (seedlings, forage, hulling, pasture grazing, dipping and bunkering) and mechanical (construction of mortar, gabion, Ghein and Chapry) in the villages located in the area [25].

Yoganand and Gebremedhin in the study showed that 60 percent of the watershed projects participants are convinced that stake-holder participation was essential to the success of watershed management project [33].

Duram and Brown have reported the success in watershed management projects don't dependents to the government support or a particular structure, but that popular participation was very essential [8].

The results of Khaleghi and Ghasemi research indicated that knowledge and the effect of education, level of awareness, social structure, ownership and income level of livestock households have an impact on the future participation of livestock breeders in rangeland rehabilitation and improvement projects [19].

Sadeghi with his Colleagues shows that there is no significant relationship found between the effects of watershed management projects on production, migration, and the extent of barren land [30].

Hematzadeh and Khaliqy showed that lack of awareness and knowledge about watershed project, poverty and lake of same projects in Region caused to people Don't participation in watershed management projects [19].

Bagaey et al., also points to the reasons for non-participation in watershed management projects in the rural: The difficulty in obtaining loans, the content isn't consistent with the needs of rural projects, financial inability, lack of respect and lack of trained manpower and skilled experts [7].

The results of the research of Arayesh and Faraj-Allah Hosseini indicated that there is a relationship between political-legal, socio-cultural factors, Extension agent's capabilities, structure and planning of extension organization, economic, psychological variables and people participation in projects. The results of regression analysis showed that among the seven variables only socio-cultural factors has a role in the Participation of people [5].

Mahmoodzadeh and Sabouri in their research found that there is a positive and significant relationship between the willingness of farmers to participate in productive economic activity. These scholars have identified factors such as educational-social, social, and government's role in creating farmers' interest in setting up social organizations and practices [20].

Merghasemi states that attention that low awareness and unknowingness of local utilities, low income and marginalized people and greedy greed caused to distribution on natural resources in Iran. Therefore emphasizes on socio-cultural, environmental and good governance considerations can play a significant role in protecting these valuable and vital resources [21].

Hossenpour showed that the economic, social, cultural, education-advocacy, policy making and formulation of poorly designed (in terms of purpose, content, implementation, etc.) were affective components on rural people non-participation in watershed management plans [16].

Pourshriati et al., in their research determined that one of the success factors in implementing rangeland and water management projects is to create an incentive for participation among residents of the watershed.

Factors affecting the participation and lack of participation projects include: ambiguity of the objectives of the plan, regardless of the short and long-term benefits of the people, not considering their advisory opinions and the lack of adequate training and extension classes in the region.

Also, the main reasons for their participation in projects: economic interest, occupation, positive attitude towards the plan, the degree of adaptation of the plans to the villagers' needs and the motivation to obtain credit for the participants in the implementation of the projects [26].

Azkia and Firoozabadi Research has shown that trust among members, the norms of mutual bargaining among members, obedience and respect of local leaders have a positive impact on the production unit of the bit in terms of better understanding, good management of production, and increased participation rates [6].

Mirdamadi and salehi findings showed that Non-governmental organizations have a positive role in preserving and restoring natural resources.

Also increasing population growth, the need for alternative job opportunities, lack of development resources, and lack of effective developmental patterns caused to excessive pressure on renewable natural resources [22].

Rasouliazar states increasing livestock farming activities in Mahabad River had caused ecological and ecological environmental pollution problems [28].

The results of the study Mutekanga et al., have shown that agricultural activities have caused erosion in the watersheds.

Soil and water conservation management measures will not be possible without the participation of stakeholders and stakeholders.

The experiences gained from the implementation of the program have shown that breakthroughs in plans and programs without community involvement are not possible [24].

Bagaey and his Colleagues in their research shows that lake of investment, lake of loans, not appropriate extension workshops, lake of natural resource experts caused the important reasons rural people to non-participation in watershed management projects [7].

MATERIALS AND METHODS

This is an applied research. In terms of collecting data, this research is descriptive and survey type. The purpose of this research was to investigation the motivation of rural people to participation in watershed management projects. Library and field study method was used to collect data. The data gathering tool was a questionnaire. The validity of the questionnaire determined by panel of faculty members and natural resource experts. The statistical population of this research includes rural people who lived in Mahabad's dam catchment (N=2458). The Cochran's formula were used to determine the sample size (n=175). The cluster sampling method was used in this research. To determine the reliability of the questionnaire, Cronbach's alpha was used. The calculated Cronbach's alpha was 0.84 that indicating the research tool was suitable. SPSS 21 software was used to analyze the data. Descriptive statistics and inferential or analytical statistics were used to analyze the findings and to achieve the research goals.

RESULTS AND DISCUSSIONS

The average age of respondents was 36 years. Respondents' agricultural experience was 24 years. Also, finding showed that the average cultivated land by respondents was 7 hectare. In addition, the average of respondents' education was 5 years; also 31.4 % of them were illiterate.

Distribution of awareness about the necessity implementation of Watershed Management projects

The results of the research showed that 50.3% of the respondents had a high level of knowledge about the types of soil erosion and their causes in the village. Also, 28% of respondents are aware of the high level of flooding and surface runoff and its causes in the village, and 26.3% of respondents have stated that they have a high level of awareness about the reduction of table water underground and its causes.

Table 1. Frequency distribution of awareness about the necessity implementation of Watershed Management projects

	Non		Very low		Low		Average		High		Very High	
	f	%	f	%	f	%	f	%	f	%	f	%
Knowledge about types of soil erosion and their causes in the village	6	3.4	23	13.1	18	10.3	40	22.9	75	42.9	13	7.4
Awareness of flooding and surface runoff and its causes in the village	-	-	17	9.7	15	8.6	94	53.7	31	17.7	18	10.3
Awareness of the reduction of groundwater aquifers and the causes of its emergence	9	5.1	8	4.6	32	18.3	80	45.7	28	16	18	10.3
Awareness of the destruction of forests and rangelands and the causes of their destruction	3	1.7	11	6.3	11	6.3	42	24	90	51.4	18	10.3
Awareness of the objectives and economic effects of Watershed management plans (increasing the level of cultivation, increasing income, etc.)	3	1.7	12	6.9	27	15.4	34	19.4	80	45.7	19	10.9
Awareness of social goals and effects (reduction of immigration, increasing social solidarity ...) Watershed management plans	3	1.7	14	8	39	22.3	28	16	78	44.6	13	7.4
Knowledge of technical and engineering methods of water management (using gangways, pools, slopes, terraces, etc.)	26	14.9	20	11.4	19	10.9	96	54.9	4	2.3	10	5.7
Knowledge of biological methods of watershed management (rangelands, seedlings, etc.)	26	14.9	8	4.6	28	16	94	53.7	9	5.1	10	5.7

Source: Research findings

Also, 61.7% of them have indicated that they are aware of the destruction of forests and pastures and the causes of their destruction, and 56.6% of them have high level of objectives and economic effects of watershed management (increased area of cultivation, Increase in income and ...). On the other hand, 52 percent of the respondents have social

goals and impacts (reduced immigration, increased social solidarity, etc.). Watershed management plans have a high level of awareness. And 54.9% of the respondents are aware of the technical level and watershed engineering (use of gangways, pools, slopes, terraces, etc.) and 53.7% of them are in A relatively moderate level of awareness of technical and water management techniques (using gangways, ponds, slopes, terraces, etc.). Other results are shown in Table 1.

Frequency distribution of respondents' views on types of Information Resources on watershed management projects

The results showed that 55.4 percent of respondents observed the study programs related to watershed management of television as one of the major sources of information on watershed design. Also, 58.9% of respondents have heard of educational programs related to Watershed Management from Radio as another source of information about Watersheds. On the other hand, 61.1% of respondents in this study have used visits from other watersheds as one of their sources of information. As well as 56.5% of the respondents, they have seen the plans of villagers and other regions as the source of other knowledge and information.

Table 2. Frequency distribution of respondents' views on types of Information Resources on watershed management projects

	Very low		Low		Average		High		Very High	
	f	%	f	%	f	%	f	%	f	%
View the training programs related to the watershed management of the TV	14	8	12	6.9	52	29.7	53	30.3	44	25.1
Listen to training programs related to Watershed Management from Radio	12	6.9	14	8	46	26.3	56	32	47	26.9
A visit to watershed management plans in other areas	10	5.7	14	8	44	25.1	59	33.7	48	27.4
A visit to the watershed management plans by the villagers	5	2.9	12	6.9	59	33.7	55	31.4	44	25.1
Study of educational-extension publications on watershed management plans	6	3.4	22	12.6	56	32	44	25.1	47	26.9
Watch educational videos-Extensions related to Watershed Designs	10	5.7	10	5.7	49	28	50	28.6	56	32
Participate in educational excellence classes - Extension of Watershed Design	7	4	7	4	53	30.3	59	33.7	49	38
Talks with Marines and Watershed Experts at the Service Center on Watershed Design	5	2.9	12	6.9	45	25.7	65	37.1	48	27.4
Talk with local breeders and trustees about Watershed Design	8	4.6	14	8	52	29.7	56	32	45	25.7

Source: Research findings.

In this study, 52% of respondents identified the study and use of promotional publications as sources of their knowledge and information. While 60.6% of respondents identified the use of educational films as sources of other information, 61.6% of them identified the training as another source of information and information. Also, 64.5 percent of respondents have talked with promoters and watershed management experts at the service center about watershed management as another source of information and information.

Also, 64.5 percent of respondents have talked with promoters and watershed management experts at the service center about watershed management as another source of information and information. It was also found that only 57.7% of respondents identified the conversation with local breeders and local trustees about the watershed design as another source of information. About 55.5% of respondents have also talked with other local operators as an important source of awareness of water management initiatives. Other results are shown in Table 2.

Prioritizing respondents' views on a variety of information sources about watershed management projects

The results showed that "conversation with propagators or natural resources experts about watershed management plans" (CV = 266)

and the "participation in the educational-extension training plans for watershed management" (CV = 269) Also, "Visit of Watershed Management Plans by Villagers" (CV = 0.273) was introduced as the most important sources of information about watersheds. On the other hand, respondents identified TV programs related to watershed management plans (CV = 0.326) as the least important source of information. Other results are shown in Table 3.

Table 3. Prioritizing respondents' views on a variety of information sources about watershed management projects

	Mean	SD.	CV	Rank
Talk with extension agents or natural resource experts about water management	3.79	1.01	0.266	1
Participate in educational excellence classes - Extension of Watershed Design	3.78	1.02	0.269	2
A visit to the watershed management plans by the villagers	3.69	1.01	0.273	3
Talk with other utilities about Watershed Design	3.60	0.987	0.274	4
Talk with local breeders and trustees about Watershed Design	3.66	1.08	0.295	5
Watch educational videos-Extensions related to Watershed Designs	3.75	1.13	0.301	6
A visit to watershed management plans in other areas	3.69	1.12	0.303	7
Study of educational-extension publications on watershed management plans	3.59	1.11	0.309	8
Listen to training programs related to Watershed Management from Radio	3.64	1.16	0.318	9
See training programs related to watershed management from the TV	3.25	1.07	0.329	10

Source: Research findings.

Prioritizing respondents' viewpoints about the important advantages and benefits of the effects of the implementation of watershed projects

Table 4. Prioritizing respondents' viewpoints about the advantages and benefits of the implementation of watershed management projects

	Mean	SD.	CV	Rank
Increases employment in the catchment are	3.78	0.926	0.247	1
Reduce pastures degradation	3.75	0.948	0.352	2
Prevents flooding	4.02	1.05	0.261	3
Increases drainage of springs	3.82	1.01	0.264	4
Gains a new experience	3.81	1.01	0.265	5
Reduces the migration of villagers	3.43	0.919	0.267	6
Significant reduction in water problems in rural areas	3.69	1.02	0.276	7
Reduces soil erosion	3.53	0.983	0.278	8
Reduces production costs in agriculture	3.69	1.03	0.279	9
Raises the village in different dimensions	3.50	0.999	0.285	10
It keeps soil and water resources	3.77	1.12	0.297	11
Raises land prices	3.57	1.07	0.299	12
Raises land prices	3.20	1.00	0.312	13
Creates social solidarity	3.28	1.05	0.320	14
It makes the village more prestigious than other villages	3.56	1.17	0.328	15

Source: Research findings.

The results showed that the increase in occupational level in the catchment area and the reduce pastures degradation and also the prevention of flood were considered as the most important the impacts the important advantages and benefits of the effects of the implementation of watershed projects. Other findings showed in Table 4.

Prioritizing the viewpoints of respondents about the economic components affecting the Motivation in the watershed management projects

The results indicated that having economic incentives for the government as a result of the implementation of the plan (CV= 291) and the " Sharing income and benefits from watershed management" (CV= 0.317), Also "Improvement cultivates land due to the implementation of watershed management" (CV=0.320) were considered as the most important economic components that affecting the participation of the villagers in watershed management projects. On the other hand, respondents of the study "introduced the private sector investment in implementing water management plans (CV = 0.537) as the least important economic components affecting the participation of the villagers in the watersheds. Other results are shown in Table 5.

Table 5. Prioritizing the viewpoints of respondents about the economic components affecting the Motivation in the watershed management projects

Economic categories	Mean	SD.	CV	Rank
Having economic incentives form government as a result of the implementation of the plan	3.64	1.06	0.291	1
Sharing income and benefits from watershed management	3.24	1.03	0.317	2
Improvement cultivates land due to the implementation of watershed management	3.24	1.04	0.320	3
Optimal use of water resources as a result of water management projects	3.56	1.16	0.325	4
Improve the financial situation of the villagers	3.21	1.25	0.389	5
Insurance of active households in watershed management	3.20	1.28	0.400	6
Lack of land and resources in rural areas	3.08	1.24	0.402	7
Access to government loans and credits	3.09	1.25	0.404	8
Granting grants for participation in water management plans	3.05	1.34	0.439	9
Private investment in implementation of watershed management	2.47	1.30	0.537	10

Source: Research findings

Prioritizing the viewpoints of respondents about the socio-cultural components

affecting the Motivation in the watershed management projects

The results showed that "the culture making among peoples for the conservation of water resources" (CV= 238) and the terms "religious beliefs about doing things through participation" (CV= 0.241) were identified as the most important socio-cultural components that affecting the participation of the villagers in the watersheds management projects.

Table 6. Prioritizing the viewpoints of respondents about the socio-cultural components affecting the Motivation in the watershed management projects

	Mean	SD.	CV	Rank
Culture making among peoples to preserve water resources	4.08	0.973	0.238	1
Religious beliefs about doing things through participation	3.74	0.902	0.241	2
Sense of empathy and responsibility for the maintenance of water resources	3.73	0.923	0.247	3
The interest in participating in the watershed between people	3.91	1.01	0.258	4
Collaborative group for solving village problems	3.78	0.980	0.259	5
Establish and strengthen watersheds cooperatives	3.50	0.915	0.261	6
Attracting people's participation in the implementation water management plans	3.43	0.912	0.265	7
Co-operation and solidarity among rural communities	3.65	0.993	0.272	8
Maintaining local values and traditions	3.73	1.02	0.273	9
Proving suitability and competence to others	3.65	1.03	0.283	10
Improving relationships with other people in the village	3.63	1.06	0.292	11
The existence of cooperative spirit among people	3.61	1.08	0.299	12
Connect with people in the village	3.26	0.993	0.304	13
Selected as a village farmer	3.66	1.13	0.308	14
Importance and position of watersheds among people	3.45	1.11	0.321	15
Existence of social communication among villagers	3.53	1.15	0.325	16
Acquiring social credit for the region due to participation and implementation of the plan	3.54	1.16	0.327	17
Acquiring social influence among the people of the village	3.49	1.17	0.335	18

Source: Research findings

The "sense of empathy and responsibility for the maintenance of water resources among people" (CV=0.247) was also find to be a very important socio-cultural component which affects the villagers' participation in the watersheds management projects.

On the other hand, respondents of the statement "introduced social penetration among the people of the village (CV = 0.353) as the least important elements of the socio-cultural components affecting the participation of the villagers in the watersheds." Other results in Table 6 it has been shown.

CONCLUSIONS

The results indicated that "the government's economic incentives as a result of the implementation of the watershed management" and the "sharing of the income and benefits of the watershed management plans" as well as the "improvement of the land crops in the area through the implementation of the project" Watershed design "was introduced as the most important economic factor affecting the participation of the villagers in watersheds. On the other hand, respondents of the study "introduced the private sector investment in implementing water management plans as the least important economic factors affecting the participation of the villagers in the watersheds.

The economic component has always had a significant impact on villagers in rural development projects and projects. Regarding the issue of participation in watershed management, the issue of attention and strengthening of economic components can play a major role in promoting the level of participation of villagers in watershed activities. Therefore, it is imperative that the government pay attention to providing villagers with incentives to implement water management plans and take effective measures in this regard. On the other hand, due to the nature of the public participation of the villagers in the watershed management, the implementation of the plans should be such as to have a general interest for the majority of the inhabitants of a region.

This will spontaneously promote the level of participation of villagers in implementing projects and protecting implemented projects. Also, the villagers are interested in seeing the results of the projects as soon as possible. Therefore, it is essential that the implementation of water drainage projects and projects is such that the villagers achieve the objectivity of the plans in a shorter time frame. The results were investigated by [13,3,19,14,4,20,23,7,8,24].

The results showed that the category "Culture-building among peoples and farmers for the conservation of water resources" and the terms "religious beliefs on doing business

through participation" as well as the "sense of empathy and accountability for the conservation of water resources" as the most important item The economic components affecting the participation of the villagers in the watershed were introduced in the watersheds. On the other hand, respondents called "social inclusion among the people of the village as the least important elements of the economic components affecting the participation of the villagers in the watersheds in the watersheds.

Social and cultural issues are always considered as one of the bases for developing rural activities. Because any project that runs in villages is unwittingly affected by the common social and cultural context among rural people.

On this basis, investing in cultural and social fields can have long-term and sustained impacts on rural development projects, and in particular on watershed management. Therefore, it is essential to protect the production of resources such as water and soil among the villagers with every facility and activity to institutionalize important issues. On the other hand, considering the religious and religious background that is taking place among the rural people, it is possible to point out the importance of protecting natural resources with standards in the hadiths, verses of the Quran and the words of the elders. And these words could be an effective motivator to engage the villagers in the implementation of water management plans.

On the other hand, it is imperative that authorities increase the sense of responsibility and strengthen empathy among the villagers. These measures are more important in the context of water management plans, because most of the water management plans are indispensable for their public nature and require villagers to take responsibility for their maintenance and conservation. Therefore, by attracting public participation, one can increase the sense of responsibility among villagers to protect and participate in the implementation of water management plans. The results were compared with the studies of [6,19,14,4,20,26,17,16,24,27,9].

Based on the findings of this research, the following avenues for improving the level of participation of villagers in Mahabad Dam basin in Mahabad city are presented:

•Promoting villagers' awareness about the consequences of water and soil erosion in rural areas.

•Provide training on the concepts of watershed management and the training of watershed practices.

•Holding classes and training courses by experienced and experienced experts for the watershed villagers.

•Conduct villagers' visits to areas where water management plans have been implemented.

•Providing economic and supportive incentives for villagers to implement water management plans.

•The use of common social-cultural backgrounds among villagers to engage in water management projects.

•Proper management of watershed management by organizations and trustees, as well as monitoring activities and activities carried out in the region.

• Using the Mahabad Sound and Measurement Capacity to raise awareness and attract people's participation in watershed activities.

•Teaching children and adolescents in village-level schools to foster the sense and responsibility of protecting and preserving natural resources.

•Remove administrative bureaucracy and carry out all steps in the city.

REFERENCES

[1]Abedi, M., 1995, Pasture and Range. Cultural Institute of the First Printing. Tehran.

[2]Afzali Abarghouie, M., Amini, A., 2010, Evaluation of Irrigation Systems in Sustainable Agriculture. The first national agricultural conference on sustainable and healthy crops, p. 4-1.

[3]Alvandi, M.D.,1998, Investigating the Socioeconomic Factors Affecting Employer Participation in Operational Management Plans. Proceedings of the first conference of natural resources for participation and development. 28 - 27 January. Office for the Promotion of Public Participation, 64 p.

[4]Amirnezhad, H., Rafiei, H.,2009, The study of the effect of socioeconomic factors on the participation of farmers in the components of rangelands. Scientific Journal of Rangeland, 3 (3): 722-710.

[5]Arayesh, B., Faraj Allah Hosseini, J., 2010, Regression Analysis of Factors Affecting People's Participation in Conservation, Revival, Development and Utilization of Renewable Natural Resources from the Viewpoint of Natural Resources Experts in Ilam Province. Journal of Agricultural Economics and Development (Science and Technology of Agriculture), 24 (1): 49-58.

[6]Azkia, M., Firoozabadi, S.A., 2004, Social capital and its role in productive formations (case study of Karkheh watershed). Journal of Sociology of Iran, 4: 49-72.

[7]Bagaey, M., Chizari, M., Fealy, S, Merzaey, A., 2006, Investigation inhabits factors on non-participation of rural people in watershed projects (case study: Zarcheshmeh Honchan). Seminar of participatory development planning of soil and water. Semnan. Iran.

[8]Duram, L. A., Brown, K. C., 1999, Assessing public participation in U.S watershed. Planning Initiatives Society and Natural Resource, 12: 455-460.

[9]Eftekhari, A., Pourtaheri, M., Sadeghloo, T., Sjasi., H., 2010, An Analysis of Factors Affecting Participatory Flood Management in Rural Areas. Rural Research Papers, 1 (2): 1-26.

[10]Ehsani, M., Khaleghi. E., 2003, Recognition and promotion of agricultural water productivity in order to provide water and food security of the country. Eleventh Seminar of the National Irrigation and Drainage Committee. Tehran

[11]Environmental Protection Agency., 2019, A look at the state of the country's soil and water resources. The statistics.

[12]Ghanbari, Y., Ghodsi, J., 2008, Investigation the socio-economic effects of watershed activities on rural stakeholders in Tangkhoshk Samirom Township. Journal Research of Esfahan University, 29(1), 195-204.

[13]Hassanli, A. Ahmadirad, S. Beecham, S., 2010, Evaluation of the influence of irrigation methods and water quality on sugar beet yield and water use efficiency. Journal of Agriculture Water management Vol. 97, pp. 357-362.

[14]Hematzadeh, Y., Khaliqy, N., 2006, Investigation affective factors on non-participation of stakeholders in watershed projects (case study: Kachekn Golestan Province). Journal of Agricultural Science and Natural Resources, 13(4), 88-101.

[15]Hojjati, M., 2018, Water consumption in agriculture. Water Economics Conference. Tehran. Dec. 29, 2018.

[16]Hossenpour, A., 1993, Investigation necessary of participation and determining the training needs of rural rancher's farmers for contribute to soil conservation and watershed management in Hezar. In Amol Township. Unpublished Thesis in Agricultural Extension and education, Faculty of agriculture, Tarbiyat Modares University.

[17]Kerchner, C.H., Honzak, M., Kemkes, R., Richadson, A., 2010, Designing spatially explicit incentive programs for habitat conservation: A case study of the Bicknell's thrush wintering grounds. International Journal by Ecological Economics, 69: 2108-2115.

[18]Kerr, J., Pangare, G., Pangare, V. L., 2002, Watershed development projects in India: An evaluation. Research Report 127, International Food Policy Research Institute. Washington, DC: IFPRI.

[19]Khaleghi, N., Ghasemi, H., 2004, Investigating the Impact of Socioeconomic Problems on the Participation Rate of Ruminants in Rangeland Projects (North of Golestan Province). Journal of Agricultural Science and Natural Resources, 11 (1): 1-10.

[20]Mahmoodzadeh, J ., Sabouri, M.S., 2014, Study on the factors affecting farmers' tendency to esatblish production cooperatives by factor analysis in Mahabad (West Azarbaijan Province). International Journal of Plant, Animal and Environmental Sciences. 4(2):245-250. Accessed on the 8th of Jully 2017.

[21]Merghasemi, S.A., 2014, Necessity of symbolism to promote the culture of natural resources. Forestry and Rangeland Watershed Organization portal. http://frw.org.ir/02/fa/news/news.aspx?nwsid=32526. Accessed on the 14th of July 2018.

[22]Mirdamadi, S.M., Salehi, F., 2004, Investigating the role of nongovernmental organizations in preserving and revitalizing forests and pastures of Mazandaran province. Forest and Range Journal (65): 56-63.

[23]Mosaey, A., 2009, Investigation affective factors on non-participation of stakeholders in watershed projects (case study: Fars Province). Journal of Agricultural Extension and Economic, 2*(*2), 65-85.

[24]Mutekanga, F.P., Kessler, A ., Laber, K., Visser, S., 2013, The Use of Stakeholder Analysis in Integrated Watershed Management. Experiences From the Ngenge Watershed, Uganda. Mountain Research and Development 33(2):122-131.

[25]Pirebabi, A., 2018, Watershed Management in the catchment area of Mahabad Dam. Interview with the super advisor of the Agricultural Extension Services Center in Abdola Kordeh sector. (Unpublished Interview)

[26]Pourshriati, R. Karimian, AS., Fattahi Ardakani, A., 2011, Investigation of the most important factors affecting participation and lack of participation of water loggers in implementation of related projects and projects. Seventh National Survey of Watershed Management Sciences and Engineering conference. https://www.civilica.com/Paper-WATERSHED07-WATERSHED07_036.html, Accessed on the 8 th of September 2016.

[27]Prager, K., Posthumus, H., 2010, Adopting sustainable soil management-The role of socio-economic Factors. 16thAnnual international sustainable Development Research conference in Hong Kong, 32 pp.

[28]Rasouliazar, S., 2019, Survey the situation of Mahabad Dam capabilities. Report of the Water Resources Conservation Council.

[29]Reddy, V. R., Reddy, M. G., Galab, S., Soussan, J., Baginski, O. S., 2004, Participatory watershed

development in India: Can it sustain rural livelihoods. Development and Change, 35 (2): 297-326.
[30]Sadeghi, S, H, Sharify, F., Frotan, A., Rezaey, M., 2004, Quanitative appraisal of watershed projects. (Case study: catchment watershed of Keshar). Journal of Research and Constriction in Natural Resources, 65, 96-102.
[31]Shah, A., 2001, Who benefits from participatory watershed development? Lessons from Gujarat, India. London: International institute for Economic Development (IIED), Gatekeeper series no.97. The Sustainable Agriculture and Rural Live lihoods Programme at the same address. http://pubs.iied.org/pdfs/14522IIED.pdf, Accessed on the 8 th of September 2016.
[32]Wani, S. P., Singh, H. P., Sreedevi, T. K., Pathak, P., Rego, T. J., Shiferaw, B., Iyer,S. R. (part3/case examples/ case 7)., 2005, Farmer-Participatory Integrated watershed Management: Adarsha Watershed, Kothapally India. Pages 123–147 in Research Towards Integrated Natural Resources Management: Examples of Research Problems, Approaches and Partnerships in Action in the CGIAR (R.R. Harwood and A.H. Kassam eds.), http://oar.icrisat.org/3678/1/161-2004.pdf, Accessed on the 22th of November 2018.
[33]Yoganand, B., Gebremedhin, T., 2006, Participatory watershed management for sustainable rural livelihoods in India. Selected working paper prepared for presentation at the Southern Agricultural Economics Association Annual Meetings Orlando, Florida, February 5-8. http://ageconsearch.umn.edu/bitstream/35343/1/sp06yo01.pdf, Accessed on the 8th of September 2016.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

NOZZLE WITH AUTOMATIC ADJUSTMENT OF THE JET POSITION

Ion SĂRĂCIN[1], Olimpia PANDIA[2], Liviu OLARU[1], Ionel Cristinel OBRETIN[1]

[1]University of Craiova, Faculty of Agriculture, 13 Alexandru Ioan Cuza Street, Craiova, Code 200585, Romania, Phone: +40 251 414398, Fax; +40 251 411688, Emails: ion_saracin@yahoo.com, liviu.olaru.dtas@gmail.com
[2]University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Email: olimpia_pandia@yahoo.com

Corresponding author: ion_saracin@yahoo.com

Abstract

In the paper the authors made a presentation of a nozzle that can endow the machines and equipment for combating diseases and pests, as well as chemical control of weeds by spraying. After describing the communications in which these treatments are performed, conditions presented in the literature, the authors refer in particular to the phenomenon of droplet drift when the speed of displacement of the aggregate exceeds certain limits or when the velocity of the air current increases accidentally during the treatment. Derivatives to spills may lead to phytotoxicity phenomena or the destruction of other cultures that do not support the active substance in the solution. It has thus determined the velocity of the air currents and dynamic wind pressure, moment and torsional force at which is subjected to the nozzle arc and the magnitude of the derivation and the random dispersion of the droplets, was the way the nozzle can be used.

***Key words*:** *phytotoxicity phenomena, dynamic, dispersion*

INTRODUCTION

The chemical weed control is the second most important work in the technology of any agricultural technology. When executing the herbicide work, for example, in addition to the weather conditions and the sprayer, it is necessary to pay particular attention to the nozzles and substances used.
For proper and effective treatment, weather conditions should not exceed certain wind speeds below 6 m / sec, a temperature below 20° C and a relative humidity of more than 60% [11].
Therefore, pesticide application equipment must be tested and diagnosed with the implementation of Directive 2009/128/EC.
The inspection procedure has been developed in accordance with the following reference documents: SR EN 13790-1: 2004 Agricultural machinery. Spraying machines. Examination of spraying machines during operation. Part 1: Sprayers used for basic crops.
The inspection shall determine:
-Pump pump [l / min];
-Diff via nozzle [l / min];
- Uniformity of transverse distribution [%];
- Normal's of substance [l / min].
In practice, it is no longer recommended to use nozzles that produce very fine splashes, but those nozzles that produce droplets larger than 100 microns. Thus, a drop that has 100 microns is transported five meters at a wind speed of 3 m / sec, while a droplet that has 20 microns is driven by wind up to 125 meters. Very small spraying droplets mean pollution and inefficient treatment [11].
A drop of solution having a diameter of less than 100 microns lives for 12 seconds and takes 22 seconds to reach the ground. If the relative humidity is less than 60% and the temperature is higher than 25° c, the drop evaporates [8].
In order to have a successful treatment and lead the solution where necessary, where necessary, we need to reduce the drift, ie the lateral transport of the particles, reduce soil contamination and optimize consumption [9].
Prior to using the equipment, we know the exact flow rate, spray angle and distribution uniformity of each nozzle (Fig.1). Nozzles for agriculture and accessory are synonymous

with efficiency and economy, while also taking into account environmental issues by reducing the yield, in particular.

Fig. 1. Bank for determining the working indices of spraying machines
Source: [9]

Spraying and spraying angles are dependent on the working pressure and viscosity of the liquid to be sprayed. Flows are set very accurately using the inductive measurement method. The spray angle is determined from the nozzle opening (Fig.2).

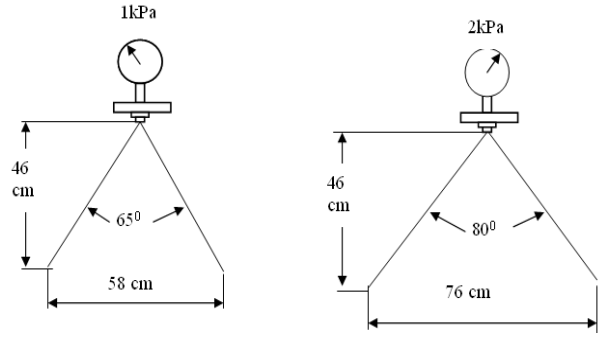


Fig. 2. Spray nozzle angle
Source: [6].

The spray width and the coating surface are based on the distance from the nozzle hole.

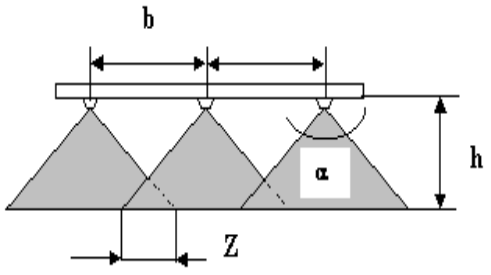


Fig. 3. The distance between the spray heads is selected according to the angle of the drop of the droplets
Source: [5]

For a better uniform distribution of the pesticide, the droplet jets of two neighboring nozzles must overlap on about Z = 15% of the surface. In this sense, the ramp has possibilities of adjusting the distance from the ground. The height h from the ground is calculated with the relation:

$$h = \frac{b+z}{2} \cdot ctg\frac{\alpha}{2} \text{ [mm]} \quad (1)$$

where:
b = 500 mm; α = 65°; 80°; 110° [12].
The flow of liquid passing through the calibrated orifice (nozzle) is given by:

$$q = 6 \cdot 10^{-2} \mu f \sqrt{\frac{2p}{\rho}} \text{ [l/m]} \quad (2)$$

where:
p - working pressure [N/m^2];
ρ - density of the liquid [kg/m^3];
f - the section of the hole [mm^2];
μ - the flow coefficient.
At the ends of the tangential sprayer μ = 0.24-0.45 and at the ends of the fan sprayer μ = 0.6-0.85.
It can be observed that q at the same section f varies with p, and the pressure p and the section f influence the fineness of the droplets (their diameter).
The amount of liquid administered per hectare of the sprayer (liquid standard per hectare N) is determined with the relation:

$$N = \frac{600Q}{B \cdot v} \text{ [l/ha]} \quad (3)$$

where:
Q is the total flow rate in l / min;
B - working width, in m;
v - travel speed in km / h [10].
The Q flow that passes through the segments of the spray nozzles is provided by the relationship:

$$Q = c\sqrt{p} \text{ [l/min]}, \quad (4)$$

where c is a characteristic constant of the nozzle and the liquid used, and the working pressure, in bars.

From the previous relationships, there are two distinct possibilities to maintain precise rules per hectare; constant maintenance of the Q / v ratio, i.e. the change of flow rate Q in proportion to the speed of the machine; keeping the report steady $\sqrt{p}/v$, i.e. changing the system pressure in such a way that the value of that ratio is constant [7].
Depending on the two, there are different machine adjustment processes, their role being always to ensure the uniformity of liquid distribution in the direction of displacement and compliance with the solution standard per hectare.
A decrease in the spray angle value by 2 .10% leads to a non-uniform distribution over the length of the spraying lance [1].
The most favorable decomposition of the jet is for the ratio: ƛ/dc = 4.42
where:
λ - the wavelength of the oscillation
dc - jet diameter.

MATERIALS AND METHODS

-Laser-Doppler Particle Analyzer, 3D presentation jet measuring device, liquid distribution systems, and more are essential conditions for accurate data measurement.
-To measure wind speed with greater precision, digital anemometers are used that measure and accurately measure the speed and direction of the wind.
-The gyro automatically controls the lowering of the small nozzle support system, the nacelle is automatically rotated by the wind direction by means of the girder, without the need for an additional swivelling system. This in turn rotates in the opposite direction to the direction of the wind holding the nozzle a few degrees keeping approximately the same position of the jet to the foil surface or ground surface, compressing the spring that supports the position of the nozzle holder.
- Flat jet nozzles.
- Bank for testing sprinklers.
- The aerodynamic tunnel [4] as presented in Fig.4.

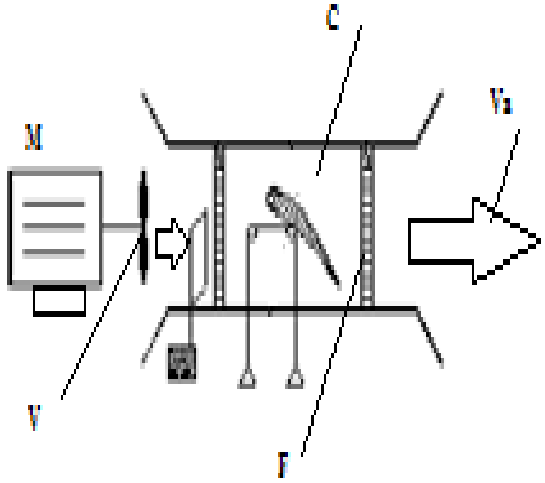


Fig. 4. Aerodynamic tunnel M- electric motor, axial V-fan, C-test chamber, F-filter, direction and speed of airflow
Source: [3].

The method used to determine the characteristics of the soil dispersal dispersion process is presented in the literature [2].
The study of the liquid cluster decomposition can be done by the small perturbation method, the probable hypothesis method and the method dimensional analysis.
Test data:
Test pressure [bar]: 2.0; 2.5; 3.0; 3.5; 4.0;
Pump Flow [l / min] 25.0; 27.5; 28.8; 31.1; 33.2;
Nozzle flow [l / min] between 1.04 to 1.44;
Unit speed [km / h] - 6 to 16 [10].

In order to have a successful treatment and lead the solution where necessary, we must reduce the drift effect, i.e. the lateral or longitudinal transport (in the direction of movement of the aggregate) of the particles, reduce soil contamination and optimize the intake of the solution.
For this purpose, the authors propose to make a device consisting of easy-to-find elements on the plate to rotate the nozzle in the opposite direction to the air flow when its speed exceeds the maximum admissible limit for the treatment [6].
The components of this device are shown in Fig.4, 5 and 6 presented below.

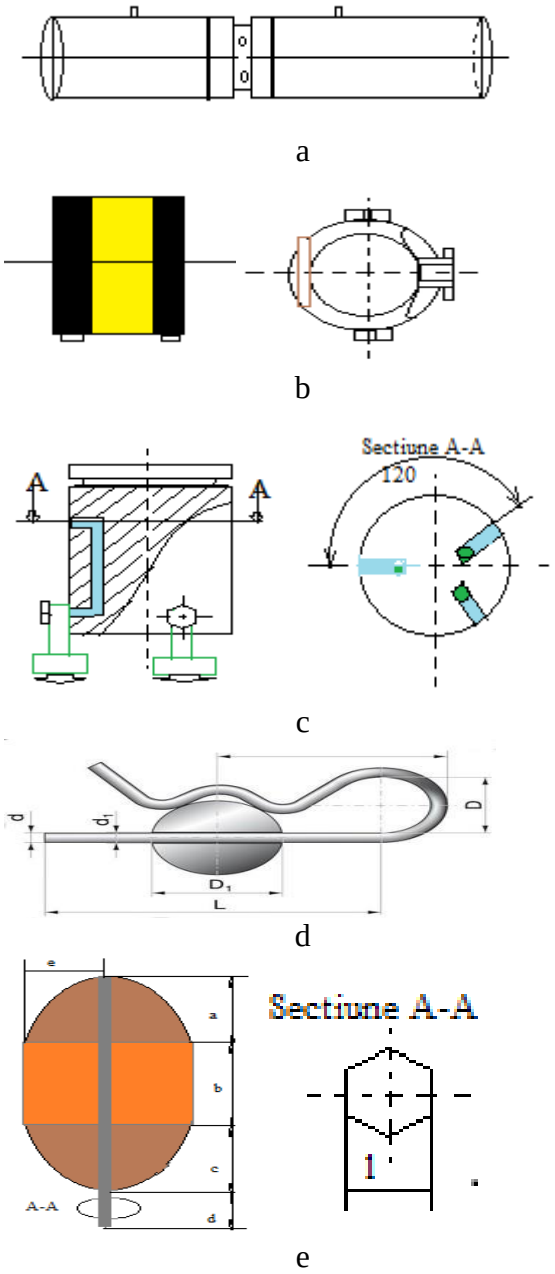


Fig. 4. Components of the nozzle jet model: a-duct, b-nozzle support, c-body distributor, d-safety, e-pellet winding
Source: authors' results.

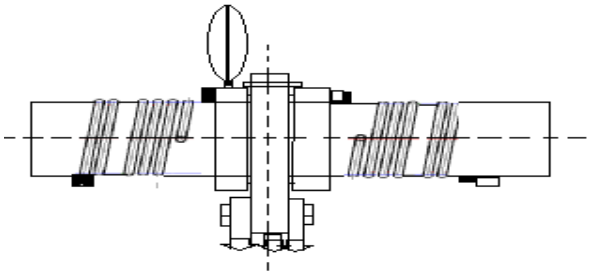


Fig. 5. Nozzle jet routing equipment
Source: authors' results.

The torsion cylindrical helical arc (Fig.6).

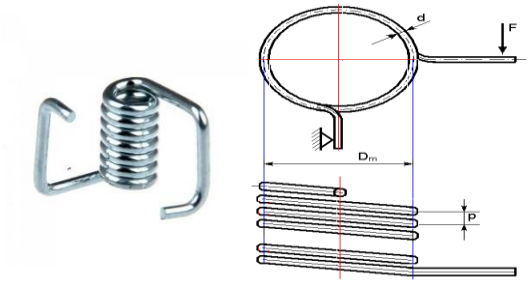


Fig. 6. Torsional cylindrical spiral arc
Source: authors' results.

In the technical field the springs are used for the property of having, in the elastic field, large deformations under the forces or moments.
Due to the large deformations of the spring under the action of forces and moments of action, the bow has the ability to store a large amount of energy.
The accumulated energy is released when the action of forces and active moments becomes zero, and the arc returns to its original shape and dimensions.
Mt is the moment of torsion requesting the arc springs;
M1, M2 are bending moments that require arc springs

$$M1 = Mt \cdot \sin\alpha \quad (5)$$

$$M2 = Mt * \cos\alpha \quad (6)$$

$$D = Dm / \cos\alpha$$

$$i = Dms / d$$

where:
Dm is the mean winding diameter of the spring;
Dms is the mean diameter of the spindle measured in the plane of the spindle;
i is the dimensional factor [5].

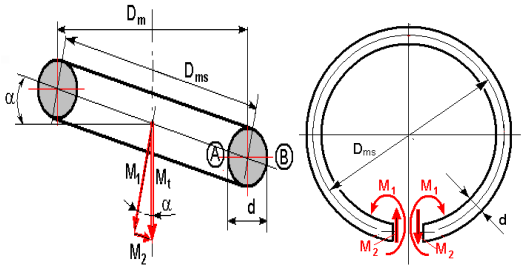


Fig. 7. Calculation of the cylindrical torsion spring, torsional stress
Source: [5]

Reference values of wind speed and dynamic pressure. The wind speed reference value

(wind speed), v_b is the characteristic wind speed averaged over 10 minutes, determined at a height of 10 m, independent of the direction of the wind in the open field (category II land with the conventional roughness length, z_0 = 0.05 m) and having a one-year probability of 0.02 (which corresponds to a median recurrence interval of IMR = 50 years). The action of the wind is considered horizontal and directional. In the case of directional expression, the wind velocity reference value v_b is multiplied by a directional factor, which takes into account the distribution of wind speed values in different horizontal directions. In the absence of directional wind velocity measurements, the directional factor is considered to be 1. 0.
The dynamic wind pressure reference value (wind reference pressure) is the characteristic value of the dynamic wind pressure computed with the wind speed reference value [4]:

$$q_b = \frac{1}{2}\rho \cdot v_b^2 \qquad (7)$$

where ρ is the air density that varies with altitude, temperature, latitude and seasons. For standard air (ρ = 1.25 kg/m^3), the reference pressure (expressed in Pascali) is determined with the relation [4]:

$$q_b\,[\text{Pa}] = 0{,}625 \cdot v_b^2\,[\text{m/s}] \qquad (8)$$

The dynamic wind pressure reference value, qb in kPa for the southern area of the country is 0.5 [4].

RESULTS AND DISCUSSIONS

When a flow of liquid is forced to disintegrate in more or less fine droplets, it is called atomization or hydraulic dispersion.
By narrowing the cross-sectional cross-section of the passage in the douse, the flow rate increases.
Static energy turns into kinetic energy (speed). When tension is released at the nozzle edge of the nozzle, a laminar flow of the fluid with aerodynamic waves occurs, causing the flow of liquid to disintegrate in droplets of different sizes (Fig.8).

a b c

Fig. 8. Spray of the flat-jet nozzle has a strong boundary line (a, c) and the nozzle (b)
Source: The authors' results.

The flat jet spray nozzle model has a strong bounded line because of the functionality features. The width of the coating can be varied by altering the geometry of the nozzle holes, where the liquid can be melded into a jet up to a flat line.
The flat fluid has a laminar shape and disintegrates with increasing distance from the nozzle opening.
The impact areas may be parabolic, trapezoidal or rectangular depending on the geometric and functional dimensions of the nozzle.
Loss of air friction and ballistic phenomena influence the spray behaviour and impact area size according to the chosen working pressure.

Table 1. Plant operating parameters

Specifications		
Speed (rot/min)	**Pressure (bar)**	**Pump Flow (l / min)**
550 rot/min	2.0	25.5
	2.5	27.7
	3.0	29.0
	3.5	31.4
	4.0	33.5

Source: authors' results.

Table 2. Flow through the nozzle

Nozzle flow rate [l / min]				
Pressure [bar]				
2.0	2.5	3.0	3.5	4.0
1.04	1.16	1.24	1.36	1.41
1.05	1.12	1.21	1.30	1.43
1,0	1.10	1.16	1.23	1.34
1.1	1.17	1.25	1.34	1.47
1.05	1.15	1.24	1.31	1.45
1.05	1.13	1.20	1.30	1.42 *

*Mean
Source: authors' results.

Calculation of wind and spring force [4]:

$$F_w = ¥_w * c_d * c_f * q_p * A_{ref} \quad (9)$$

where:
q_p - the dynamic pressure reference value
q_p = 0.5 or 0.7

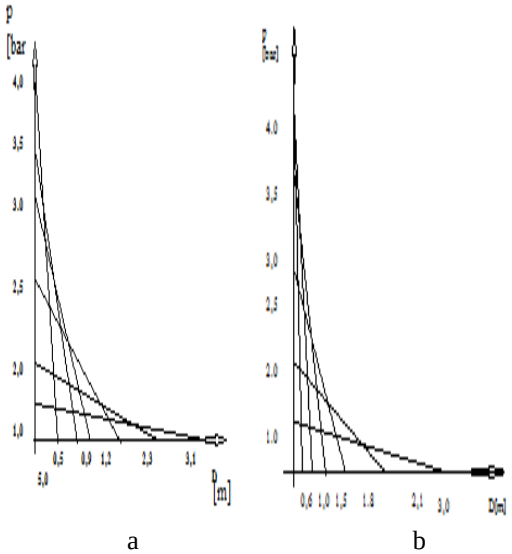
$$q_p = 0.625 * V_b^2 \text{ [m/s]} \quad (10)$$

c_d - dynamic response rate of about 0.95;
c_f - aerodynamic coefficient according to the ratio b / d ≤ 0.25 is between the values -0.5 and -1.1.
A_{ref} - Reference area [m^2]

$$A_{ref} = S_1 + S_2 + S_3 \quad (11)$$

A_{ref} = 44.6 [cm^2];
¥ $_w$ - factor of importance / exposure, for land the second category is = 2.2.
F_w = 2.2 * 0.95 * 0.8 * 18.9 * 0.0446
F_w = 1.4 [N]
M_T = 1.4 * 0.03 * 0.04 [N * m]

The diagrams of the longitudinal distribution of solution droplets at the working pressure, the nozzles being placed 0.5 m from the ground (Fig.9).



a b

Fig. 9. Diagrams of the longitudinal distribution a- with an anti-wind direction, b- with motion in the direction of the wind
Source: authors' results.

Fig. 10. Deviation of solution jet by wind speed
Source: authors' results.

Fig. 11. The distribution of droplets on the surface according to the deviation of the jet
Source: authors' results.

Very small droplets, obtained by fine and very fine spraying, can be moved by the wind and the air currents during the treatment.
Their uncontrolled movement makes them no longer attain to the desired target. In this situation, the biological effect of the treatment can be seriously diminished.
In the case of long-distance drift of very small droplets, there is a risk of contamination of neighbours (adjacent crops, water courses, lakes, etc.).
Even medium droplets can be moved by wind if it has speeds of certain values. Optimal wind speeds up to which spraying treatments can be performed are between 2 and 6.5 km/h [12].

CONCLUSIONS

Carrying out work to control diseases and pests and weeds by means of liquid solutions requires knowledge of the solution, knowing the environmental conditions knowledge of the machine or the equipment used.
The importance of the treatment is greatly dispersed and the design of the drops at the treatment site.

The speed of movement of the aggregate but also the velocity of air currents are of great importance in the phenomenon of dripping droplets of solution.

By using the nozzle model proposed to carry out the spraying work in general, the drip drift effect can be diminished, and it is also possible to perform the works in other environmental conditions than those presented in the literature

REFERENCES

[1]Bolintineanu, Gh., Vlădut, V., Popescu, M., 2006, Guidelines, directions and requirements in the field of phyto-sanitary protection equipment on the threshold of Romania's accession to the EU, Scientific Papers INMATEH Bucharest, Vol. 18, (3):115-125.

[2]Bolintineanu, Gh., Pirna, I., Matache, M., Uceanu, E., Postelnicu, E., 2008, Research on plant testing machines, according to European norms in force, Scientific Papers INMATEH Bucharest, Vol. 24, (1):14-20.

[3]Creation of Aeronautic Technology (Creeaza Tehnologie aeronautica), http://www.creeaza.com/ tehnologie/aeronautica, Accessed on Jan.6, 2019.

[4]Design Code. Evaluation of Wind Action on Buildings, CR 1-1-4/2012, Technical University of Bucharest.

[5]Frăţilă, M., 2014, Determination of stress and strain and helical spring torsion, Proceedings of The XIVth International Multidisciplinary "Professor Dr. Dorin PAVEL, The foundre of the Romanian Hydroenergetics", Sebes, pp.503-508.

[6]Heiyne, G.C., 1979, Pesticide Application Systems, Imperial College Field, Station Slowd Park.

[7]Herbst, E., Prüftechnik, H., 2008, Testing of spraying machines. Electronic analysis of test reports, Scientific Papers INMATEH Bucharest, Vol. 24 (1):30-33.

[8]Langenakens, J.J., 2008, Inspection of spraying machines: what is important novelty in standard EN 13790, Scientific Papers INMATEH Bucharest, Vol. 24 (1):34-43.

[9]Lechler India-Leading manufacturer of spray technology equipment in India, http://www.lechler.com, Accessed on Jan.6, 2019.

[10]Popescu, M., Gângu, V., Cojocaru, I., 2007, Research on the optimization of the qualitative working indexes of field crops, Scientific Papers INMATEH Bucharest, 2007 - III, Vol. 21, pp. 63-68.

[11]Ranta, O., 2018, The myth of the fog at the herbicide, www.agrointel.ro, Accessed on Jan.6, 2019.

[12]Toma, D., Neagu, T., Florescu, **I**., Lepi, S., 1982, Tractors and Agricultural Machinery, Vol. II, Bucharest, Didactical and Pedagogical Publishing House, Bucharest, pp.174-178.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

FORMATION AND DEVELOPMENT OF CLUSTER ACTIVITY IN RUSSIA'S AGRICULTURE

Dmitriy Valerevich SERDOBINTSEV, Ivan Sergeevich NOVIKOV, Elena Aleksandrovna ALESHINA

Volga Scientific-Research Institute of Economics and Organization of Agro-Industrial Complex (VRIEOAIC), Sector of Development of Integration and Cooperation, 12 Shekhurdina Street, Saratov, 410010, Russian Federation, Phones: +79042424332, +79003149666, +79172056574, E-mails: serdobintsev@mail.com, novicovis@yahoo.com, aleshina-80@mail.ru

Corresponding author: novicovis@yahoo.com

Abstract

The purpose of the paper was to analyze the current state of development of cluster activity in the agro-industrial complex (AIC) of Russia, to identify the main constraints and to develop proposals for enhancing the formation of clusters. In preparing the article, there were used information from the Ministries of Economic Development and Agriculture of the Russian Federation, the Russian and European cluster observatories, scientific works of domestic scientists on the topic. The following methods of scientific research were used: statistical-economic, monographic, abstract-logical, design-constructive. At present, the active processes of developing cluster activities are underway in the Russian agro-industrial complex. But not all of the initial set of registered projects for creating clusters in the agro-industrial complex were implemented. It is revealed that the main constraints on the wide spreading of clusters are: methodological flaws, non-optimal segregation of duties at the public and private levels, underdevelopment of the regulatory framework, the lack of a common mechanism of formation and a model of cluster functioning at the regional level. In order to compensate for these shortcomings, a mechanism of formation (order) and a model (organizational structure) of the functioning of agro-industrial clusters are proposed. The introduction of the mechanism of cluster formation, due to the savings from optimization of costs and processes of commodity circulation, will allow to reduce the cost of production and increase the efficiency of economic interactions of enterprises.

***Key words*:** *agriculture, cluster activities, current status, Russia*

INTRODUCTION

Improving the efficiency and competitiveness of enterprises on the basis of the cluster approach in the last decade has received wide coverage in scientific papers. This trend is due to a number of advantages of clusters compared to traditional methods of production and commercial interaction - reducing the costs of turnover, eliminating duplication of functions and the overall synergistic effect [12] for each of the participants, due to broader and more comprehensive integration [1].

These advantages are determined by the two-tier organizational structure of the production cluster, which consists of 2 main elements: the core - the main producing, processing and marketing enterprises, and the satellites - ancillary enterprises, supplying additional goods, works and services for the cluster core [23].

In the structure of scientific theories, the theory of cluster development is one of the main directions and schools of the Theory of Regional Economic Growth, and belongs to the section of the New Forms of the Territorial Organization of Production, which is usually divided into 3 scientific schools: American, British and Scandinavian [8]. However, it can be noted that the concept of a cluster is mainly used by representatives of American scientific thought, while the rest, despite the fact that they resort to territorial groupings of enterprises of various industries, still try to use other terms. Representatives of Britain in their studies mainly focus on investments and financial flows in production associations. Scientists from the Scandinavian countries prefer the topic of innovation and

education, directly linking the competitiveness of states with their research and educational potential [14]. Among the representatives of the American school, perhaps the most significant are the works of Michael Porter "The Competitive Advantage of Nations" (1990) and "Competition" (1998), where, through the lens of his Rhombus of competitive advantages, he examines the relationship between cluster partnership and the competitiveness of firms, industries and national economy [15,16]. Other representatives of the American school are [4, 9, 18, 20], while developing the theory of production clusters, they emphasize the regional essence of clusters, and then they will be followed by diversification and access to the next levels. In recent years, many researchers have paid attention to the social importance of agro-industrial clusters (by including small businesses in the composition and development) to improve economic well-being and improve the quality of life of the rural population [5, 6,7, 13, 22].

Due to the positive international experience of developed countries (EU, USA), where clusters have become a natural stage in the evolution of production organization methods and developing countries (China, Argentina, etc.), where they are the main way of achieving world-class development and entering international markets [19], cluster methods began to take root in the Russian land. The result of these processes has been the increasing mention of clusters in various bills, concepts, and investment programs at the federal and regional levels [11]. For example, in the Concept of the long-term socio-economic development of the Russian Federation for the period up to 2020, the term “cluster” is mentioned 20 times in a different context. And among the works of Russian scientists, the works of [14] devoted to the history of development, the definition of the essence and the main differences of clusters from other forms of integration and cooperation. At the same time, research into various aspects of cluster formation in the agroindustrial complex, which are considered in the works of [1, 2, 3 and others].

However, despite the growing popularity, the widespread clustering in the agro-industrial complex is constrained by the problems of the lack of uniform theoretical and methodological foundations and conceptual and categorical apparatus, legislatively established organizational and legal form and, accordingly, insufficient state support. At the same time, if the inclusion of cluster projects supported at the federal level in recent years has already been sufficiently developed, the lack of a single mechanism for the initial formation of clusters at the regional level is today the main deterrent to their widespread use in agriculture. At the same time, the peculiarities of the state regulation system limit the possibilities of management and support with regard to informal associations, and also create the need to direct the activities of clusters to the legal mainstream and to develop mechanisms for bringing clusters to the form of formalized structures. Therefore, at the present stage of development, the main role in solving the tasks of ensuring effective functioning and enhancing the competitiveness of enterprises belongs to the development of the optimal organizational and economic mechanism of formation and the cluster functioning model, which makes the topic put on the research particularly relevant and timely.

MATERIALS AND METHODS

In preparing the article, information from the Ministries of Economic Development and Agriculture of the Russian Federation, the Russian and European cluster observatories, the works of Russian and foreign scientists on the cluster topic, materials of research organizations from different countries of the world were used. In the study of theoretical and methodological aspects of the various organizational and economic elements of the development of cluster activities used monographic and logical methods. The study of the current state of implementation of cluster initiatives in the agro-industrial complex of Russia was carried out on the basis of statistical and economic analysis, as well as by comparing the results of work using the comparative analysis method.

Determining the directions of development and structuring the organizational and economic mechanism for the formation of regional agro-industrial clusters was carried out using the abstract-logical and computationally-constructive methods.

RESULTS AND DISCUSSIONS

As a result of research, we found that in Russia for more than 10 years the mechanisms of state regulation and budget financing of the development of cluster activities in the agro-industrial complex and other sectors of the economy have been actively developing. A lot of work has been done on the formation of methodological and legislative bases for the development of cluster activities and support of already formed and formalized clusters.

A start was made in 2006–2007, when Michael Porter with a group of scientists from the Russian Center for Strategic Research was assigned to conduct a study of Russia's competitive advantages. According to the results, the paper "Competitiveness at the Crossroads: Choosing the Future Direction of the Russian Economy" was published, where, based on a study of various industries, clusters were proposed in the metallurgical, timber and oil and gas sectors of the Russian economy [17]. In fact, the authors paid attention only to the country's raw materials, but they ignored the presence of large agricultural areas, a favorable climate and other opportunities for the development of the agricultural sector.

For the above reasons, the Ministry of Economic Development of Russia was engaged in all of the cluster development activities at the initial stages. In 2008, Methodological recommendations were developed for the implementation of cluster policy in the constituent entities of the Russian Federation and the List of programs for the development of pilot innovation territorial clusters was approved. Later in 2013, the Rules for the distribution and provision of subsidies for the implementation of activities envisaged by the development programs of the pilot clusters were adopted. Initially, in 2013, the total amount of subsidies for development programs for 25 cluster projects in 19 regions of the country identified through competitive selection amounted to $ 40.9 million. Then, in 2014, the volume of state support increased to $ 65.8 million, but in 2015, due to the crisis in the economy, cluster financing decreased by half. At the same time, about 70% of the allocated funds were directed to the development of cluster infrastructure. In 2015, these clusters produced products in the amount of $ 32.8 billion, which is a third more than the figure for 2013. (*In the Ministry of economic development in 2016 will expand the program of support of territorial innovation clusters. Retrieved from http://economy.gov.ru/minec/about/structure/depino/20160220*) [10]. Now the Ministry of Economic Development to focus attention on promising areas is starting a new format of subsidizing cluster initiatives in the form of the Priority Project "Development of innovative clusters-leaders of world-class investment attractiveness". But at the same time, the list contains clusters that specialize mainly in engineering, pharmaceuticals, petrochemicals, electronics, nuclear and biotechnologies, and not a single agro-industrial cluster.

At the next stage, from 2015, the Ministry of Industry and Trade joined the Ministry of Economic Development and Trade, as the new Federal Law "On Industrial Policy" designated the formation of industrial clusters as one of the main tools for the territorial development of industry. Similarly, the Ministry of Industry and Trade adopted the Rules for granting subsidies to industrial cluster members and selected 8 cluster projects in the fields of electronics, engineering and instrumentation, but also none of the sectors of the agro-industrial complex. Also in 2015, the Ministry of Health adopted the Law "On the International Medical Cluster", and also began the formation of a number of scientific and educational medical clusters. And the Ministry of Energy plans to create coal-energy and coal-chemical clusters that produce products that are in demand on world markets,

and Gazprom Oil forms a cluster of oil refining processes.

It must be said that such increased interest in clusters caused a rapid growth in the development of cluster projects. By 2013, the Ministry of Economic Development of Russia had already registered about 221 cluster projects in 58 of 83 regions or in 70% of the territories. At the same time, by industry, the largest number (41 clusters or 19%) was in the field of agriculture. But these were only promising projects. At the same time, according to the data of the European Cluster Observatory in 28 countries of Western and Eastern Europe, 2101 clusters already functioned in various sectors of the economy with a total of 42 million employees. At the same time, 11.5% of them operate in the agro-industrial complex, employing 4.5 million people [19].

Few time later, only some of the announced cluster projects in the Russian agro-industrial complex could be realized in practice. So, in 2018, the Russian Cluster Observatory marks only 4 operating clusters in the agro-industrial sector: The Cluster of Aquaculture and Fisheries (Astrakhan Region - 37 participating enterprises), the Food Cluster (Republic of Tatarstan - 20 enterprises), The Milk Cluster (Vologda Region - 58 enterprises) and Agro-industrial cluster (Novgorod region - 22 enterprises). And the Ministry of Agriculture of Russia itself speaks of targeted support for only 2 clusters - this, in addition to the Aquaculture Cluster in the Astrakhan Region, is also the Cluster of Agrarian Engineering in the Altai Territory (22 enterprises) (*The Ministry of agriculture of Russia held a meeting on the «all-Russian field Day» in the Altai region – the Ministry of agriculture of Russia.* [21]. However, the Ministry of Agriculture of Russia, like many other departments, has not yet consolidated any cluster projects at the legislative level, has not developed methodological support and has not created working groups for the development of cluster activities, entrusting all regions or private initiatives.

At the same time, in most regions of Russia, all clustering activities are concentrated in the Cluster Development Centers (CDCs), which were organized in 19 regions in 2010–2013. They are very similar to each other in terms of the creation history, the organizational structure, the circle of tasks to be accomplished, the goals set for the work and the functions performed. This is explained by the fact that all CDCs were created for the purpose of including in the List of pilot development programs for territorial clusters of the RF Ministry of Economic Development, where one of the conditions for obtaining state support was the presence of a specialized organization engaged in cluster development. At CDCs, cluster projects are implemented in all sectors at once, including and in the agro-industrial complex. Moreover, even if some projects failed to qualify and receive federal funding, the regions continue to support them.

One of such few examples of the real formation and functioning of the agro-industrial cluster in the regions of Russia is the confectionery cluster of the Penza region "Union of Penza confectioners". In order to identify problems and develop general recommendations, we investigated the experience of creating and developing the activities of this cluster, by means of on-site interviewing of employees of participants in the confectionery cluster. This industry was chosen to create a cluster, because the Penza region produces 30% of all confectionery products of the Russian Volga region, consisting of 8 regions (Republic of Kalmykia and Tatarstan, Astrakhan, Volgograd, Samara, Saratov and Ulyanovsk regions). At the beginning, when developing the concept of a confectionery cluster, the Central Design Bureau had to resort to the help of a specialized company from Moscow, which had already developed several similar projects in other regions of the Russian Federation. During the organizational period for the creation of a cluster, the work of the CDCs consisted in organizing a constituent assembly of the cluster and signing cooperation agreements between the CDCs and confectionery enterprises, as well as with research and educational institutions. The

most difficult and long time was the organization of work directly with the confectionery enterprises. The work was complicated by the fact that confectionery enterprises that are competitors, without much desire, took part in the formation of the cluster, since not fully understood the essence and purpose of the cluster itself. In the future, in order to unite and establish contacts between the participants of the CDCs, joint participation of confectionery enterprises in food fairs was organized. This event gradually had a strong impact on the participating companies, which noted all the advantages of such joint performance on the market, which allowed them to conclude a number of contracts for the supply of products and establish business relations with each other. For the following exhibitions, the participants of the cluster also decided to act as a united front, with the aim of which CDCs was developed a single trademark of "the umbrella brand" - "Penza confectionary yard". As a result of such joint work, close contacts were established between exhibitions and excursions between confectionery enterprises, which by now allow them to organize joint deliveries of products to remote regions of Russia and enter into contracts for the purchase of industrial raw materials in larger volumes at attractive prices to optimize costs. Today, the confectionery cluster includes about 50 enterprises of the region engaged in the production of powdery and sugary confectionery. The largest anchor enterprises of the cluster are Miroslada LLC, Severyanin LLC and Bekovsky RPK Oktyabr LLC, with annual economic turnover of about 21, 9 and 4 million USD, respectively.

The cluster satellites that ensure the development and implementation of innovations, technologies and equipment are research organizations in the region - research centers at the Penza State Agricultural Academy and the Penza State Technological Academy, Technology Commercialization Center, Penza Regional Innovation Support Fund.

The educational satellites that provide training and retraining of personnel for enterprises of the cluster include several educational institutions, some of which also provide scientific research:

−Penza State Agricultural Academy;
−Penza State Technological Academy;
−Penza Cossack Institute of Technology;
−Penza State University;
− Penza College of Food Industry and Commerce;
−Other Colleges of various profiles from areas of the Penza region.

In addition to the CDCs, the coordination, management and support of the cluster's activities are carried out by a number of ministries and departments, the Penza Regional Chamber of Commerce and the Penza Region Development Corporation. The study of the work allowed to schematically represent the system of governance of the confectionery cluster (Figure 1). The cluster development plans for the future envisage the implementation of a number of investment projects: organizing the production of caramel 2.2 thousand tons per year with a volume of investment of 4 million USD, the creation of production of 2.9 thousand tons of jams worth 2.7 million USD construction of a distribution center with a warehouse of 5 thousand square meters. The implementation of these projects will allow confectionery enterprises in the region to increase their share in the Russian market from 3.27% in 2012 to 15% by 2020, which makes it possible to look with confidence to the future prospects of the confectionery industry of the Penza Region.

Thus, it can be stated that at the moment active processes of cluster formation are going on in the Russian agro-industrial complex. At the same time, an important role in the organizational and economic mechanism belongs to a private-state partnership and a clear division of tasks between the state and enterprises, thanks to which it is possible to optimize the process of formation and functioning of agro-industrial clusters.

But many ambitious projects were not implemented or partially implemented. For example, in the Ulyanovsk region, the cluster project "New Village" was supposed to ensure the development of production and improve

the living conditions of agricultural workers. The cluster project included a modern settlement of 100 houses with a developed infrastructure (medical, educational, sports and shopping and entertainment facilities), a research center, 140 modern mini-farms for the production of livestock and plant products, meat processing, dairy and feed mills. And the Penza Region Development Corporation was preparing for signing an investment agreement with a German company to establish an agro-industrial cluster in the region - a large association for the storage and processing of grain, the production of animal feed, bakery and pasta.

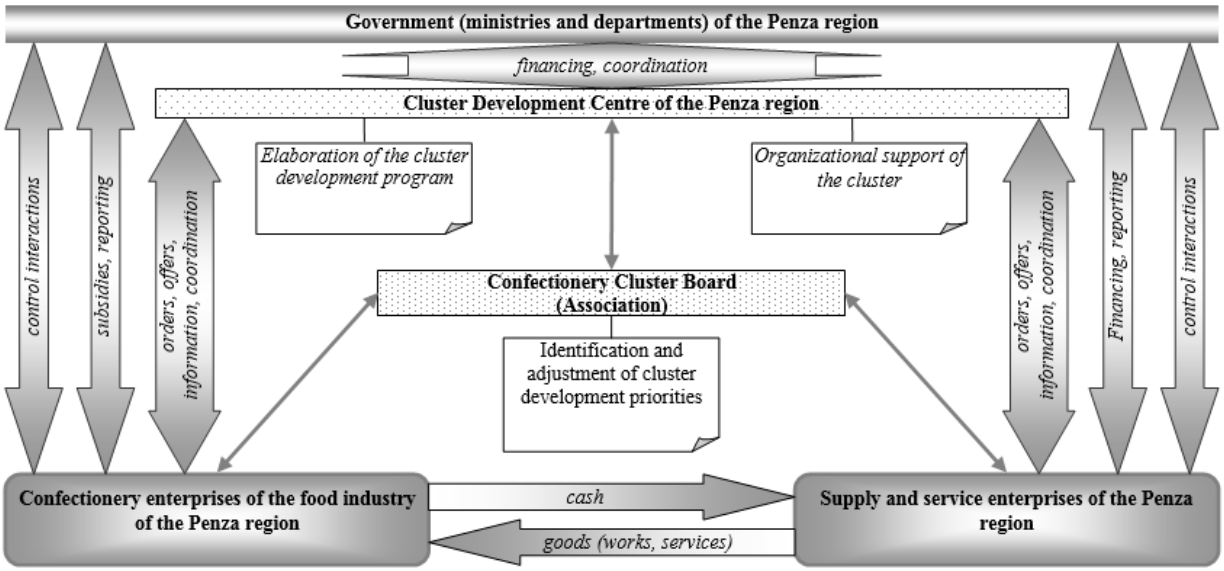


Fig. 1. The control system of the confectionery cluster of the Penza region
Source: Compiled by the authors.

One of the reasons was the fact that not enough attention is paid to the method of detecting protoclusters. When developing programs and choosing cluster specialization, no research is done on localization and competitiveness of industries. Almost all developments are made on the basis of expert methods. The issues of the initial formation of clusters, their bringing under the adopted normative acts on state support of development programs are not sufficiently worked out. And to be included in the list of state support, it only need to comply with the requirements - the presence of the manager of the organization, the overall development program, several investment projects, etc. At the same time, existing protoclusters based on holdings with a developed production core (agriculture, processing, sale) can be ignored. And for a full cluster, they lack some satellites. However, some of them even have their own research centers, financial and credit, educational, and supplying organizations.

Our researches of practical work on the development of cluster activities in the agro-industrial complex made it possible for us to identify some characteristic features and disadvantages:

-The lack of a unified mechanism for the formation of agro-industrial clusters with the division by the main organizational and economic elements and the distribution of the main tasks at the state and private levels. Therefore, various tasks are not developed and executed by those organizations, which leads to confusion or decision-making.

-The absence of a universal model of functioning of agro-industrial clusters, dividing the participating companies into the core and satellites of the cluster and distributing the main commodity-cash flows. As a result, many of the necessary organizations are missing from the cluster structure, and some are served in an inappropriate functional group of enterprises.

-Lack of specialized legislation and by-laws in the field of formation and functioning of agro-

industrial clusters, at the federal and regional levels. Therefore, there is a non-optimal legislative activity that does not quite meet the needs of enterprises and the CDCs leading to the reproduction of non-performing documents.

-Insufficient methodical study of all stages of development of cluster activity even within the CDCs, as a result of which all initiative groups have to literally "grope for a path".

-When selecting industries for the formation of clusters, methods for determining competitiveness and identifying potential clusters are not used, which is why industries and areas of clustering are often not quite right.

-Lack of funding, due to which many announced expensive and labor-intensive activities are not implemented, with the result that the real work simply does not work, which does not allow businesses to be interested.

-A single cluster policy at the federal level has not been formed - almost all actions for the development of cluster activities are either pin-point or depend only on the initiatives of regional authorities.

In order to compensate for these shortcomings, we have formed an organizational-economic mechanism for the formation of regional agro-industrial clusters with a functional subdivision of tasks at the state and private levels on economic and organizational elements (Figure 2).

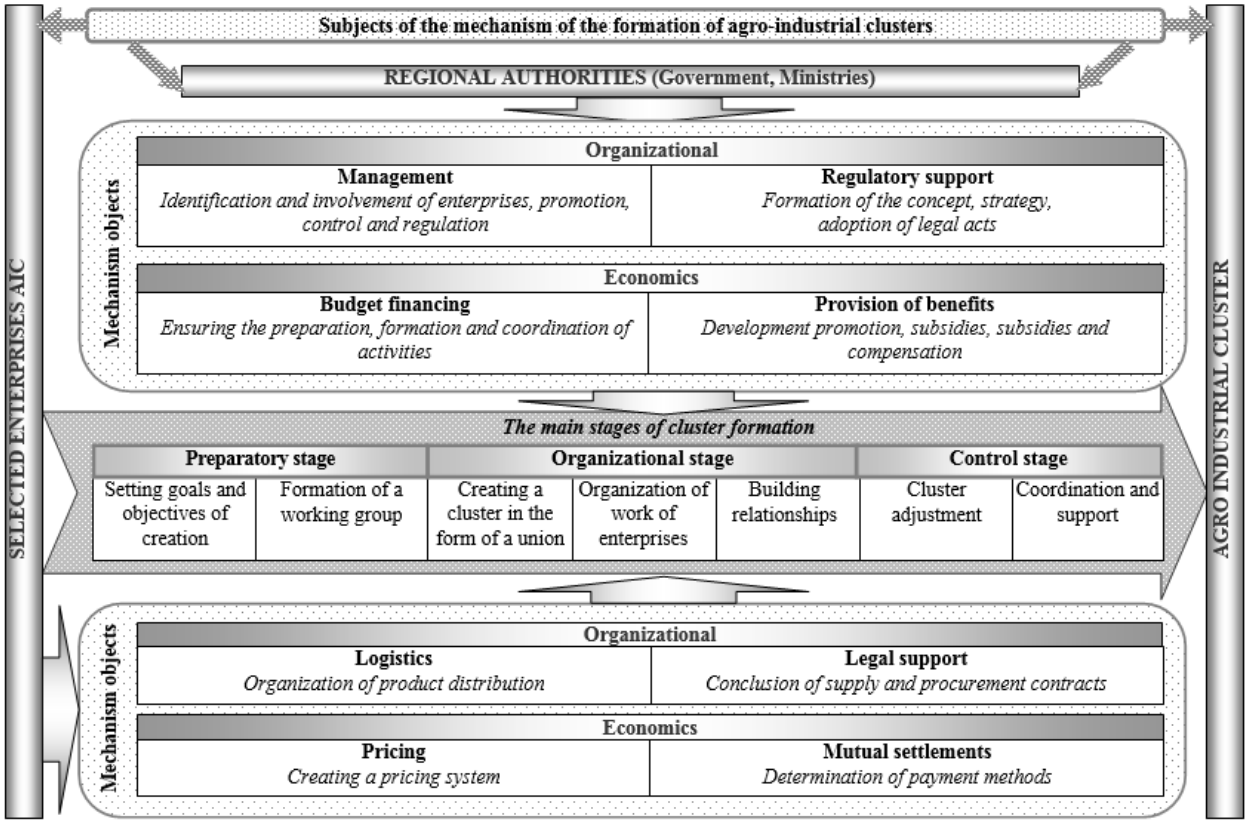


Fig. 2. The organizational and economic mechanism for the formation of regional agro-industrial clusters
Source: Compiled by the authors.

This is due to the fact that the solution of the large-scale task of forming clusters is impossible on the single initiative of market participants, and must also be carried out at all levels of legislative and executive power. However, the main initiative should come from potential members of the cluster, and the administration should provide full support, especially at the initial stages, by promoting the benefits and designing the cluster.

In order to further develop research, develop practical recommendations and consider the

initial stages of cluster formation in the agro-industrial complex, the cluster construction procedure in the agro-industrial complex was structured, in which the main performers and their activities were singled out (Figure 3).

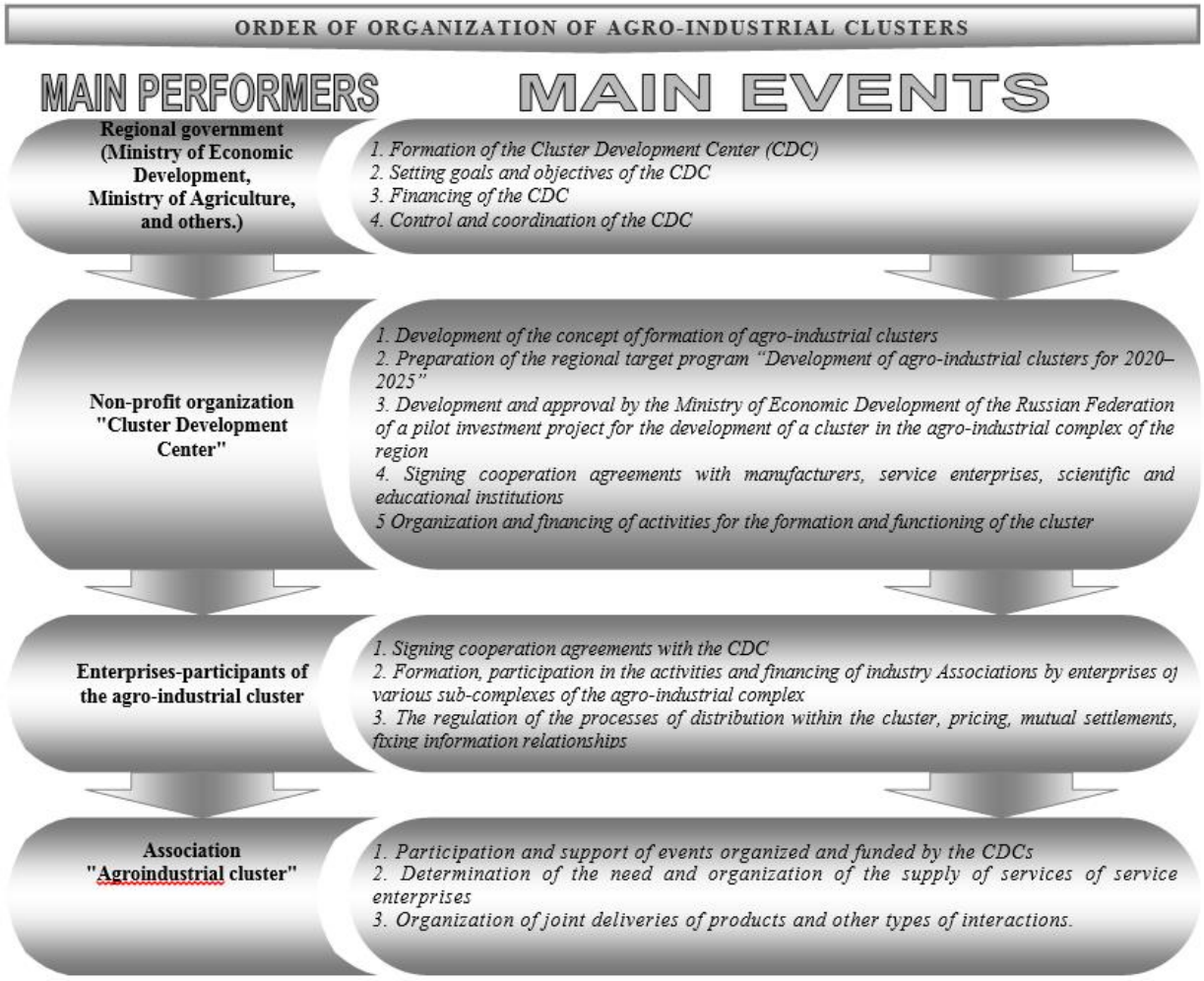


Fig. 3. Main events, order and participants in the formation of agro-industrial clusters
Source: Compiled by the authors

The choice of performers is determined by the range of tasks to be accomplished, assigned to these bodies of state power by the relevant regulatory and legal acts. At the same time, the creation of Cluster Development Centers is also required in other regions for the widespread activation of cluster activities. At the same time, the created CDCs will not limit its activities only to the framework of one branch of the economy, since It will be a single organization for the integrated development of clusters, which makes expedient its formation at regional ministries of economic development.

As a result, we have developed a organizational-economic model of functioning of the agro-industrial cluster, including the corresponding set of agribusiness companies, which is presented in Figure 4.

The organizational structure of the agro-industrial cluster is determined by the factor of the presence in the region of the necessary number of certain enterprises and other related industries.

When forming a cluster, it is especially important to organize interactions with satellite enterprises supplying diverse types of goods (works, services).

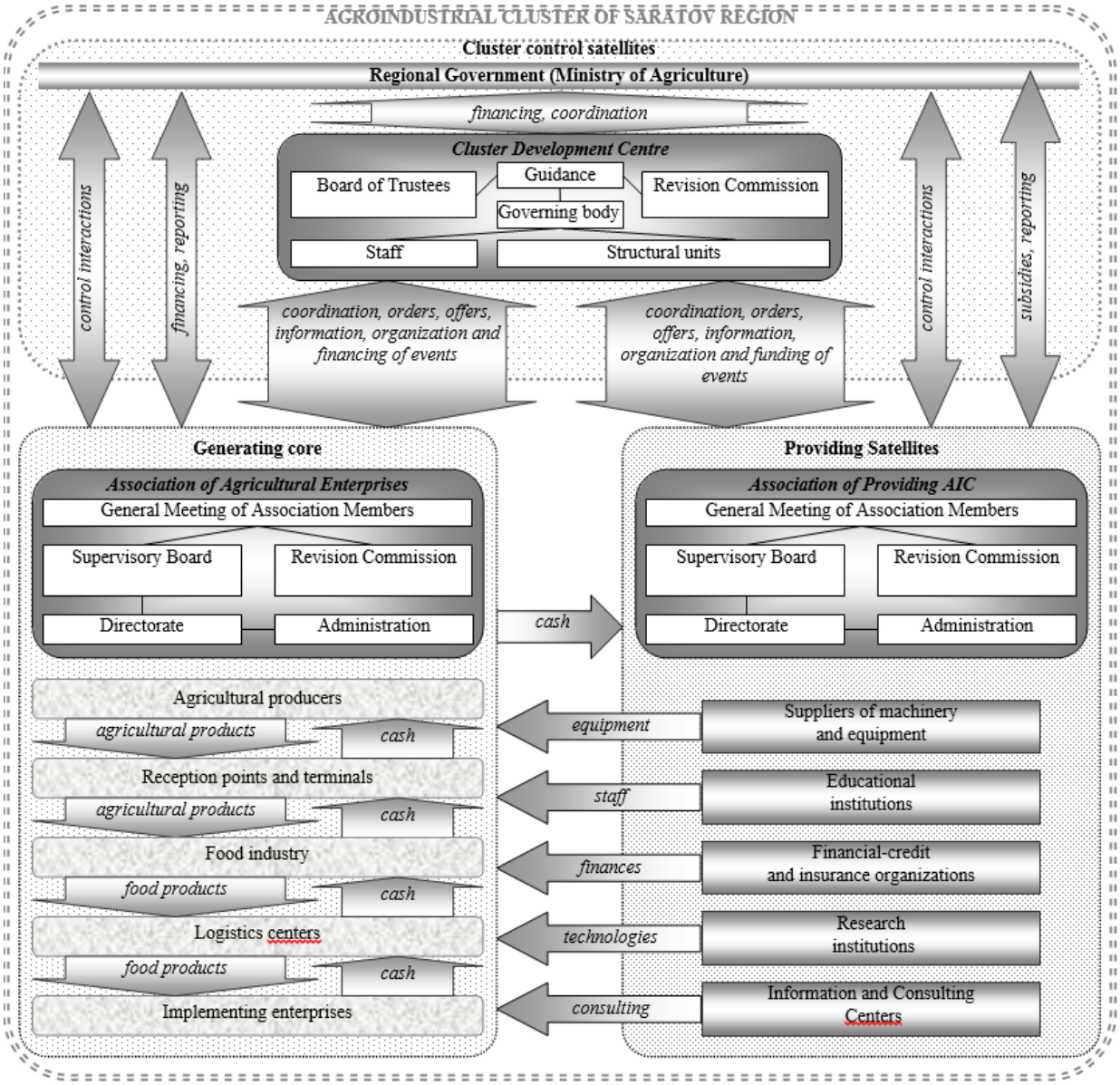


Fig. 4. Organizational-economic model of the agro-industrial cluster of the Saratov Region
Source: Compiled by the authors

For example, in one of the typical agrarian regions of Russia - the Saratov region there is a significant number of supply and service enterprises, which allows us to freely form a satellite belt around the cluster core. Development, coordination and support of ongoing projects for the creation of agro-industrial clusters are the prerogatives of the Ministry of Economic Development and the Ministry of Agriculture, in order to ensure effective and coordinated tasks that require the formation of a cluster development centerThe task of staffing is solved by the presence of a sufficient number of educational institutions, such as the Saratov State Agrarian University named after N.I. Vavilov, colleges and a network of vocational schools. The development and implementation of scientific innovations will be provided by many specialized research institutions.

Based on this set of enterprises, a universal organizational structure of the agro-industrial cluster was created using the example of the Saratov region - Figure 5. At the same time, depending on the specialization of future clusters, the core of this structure will be filled with enterprises of various AIC subcomplexes: grain products, meat products, dairy products, etc.

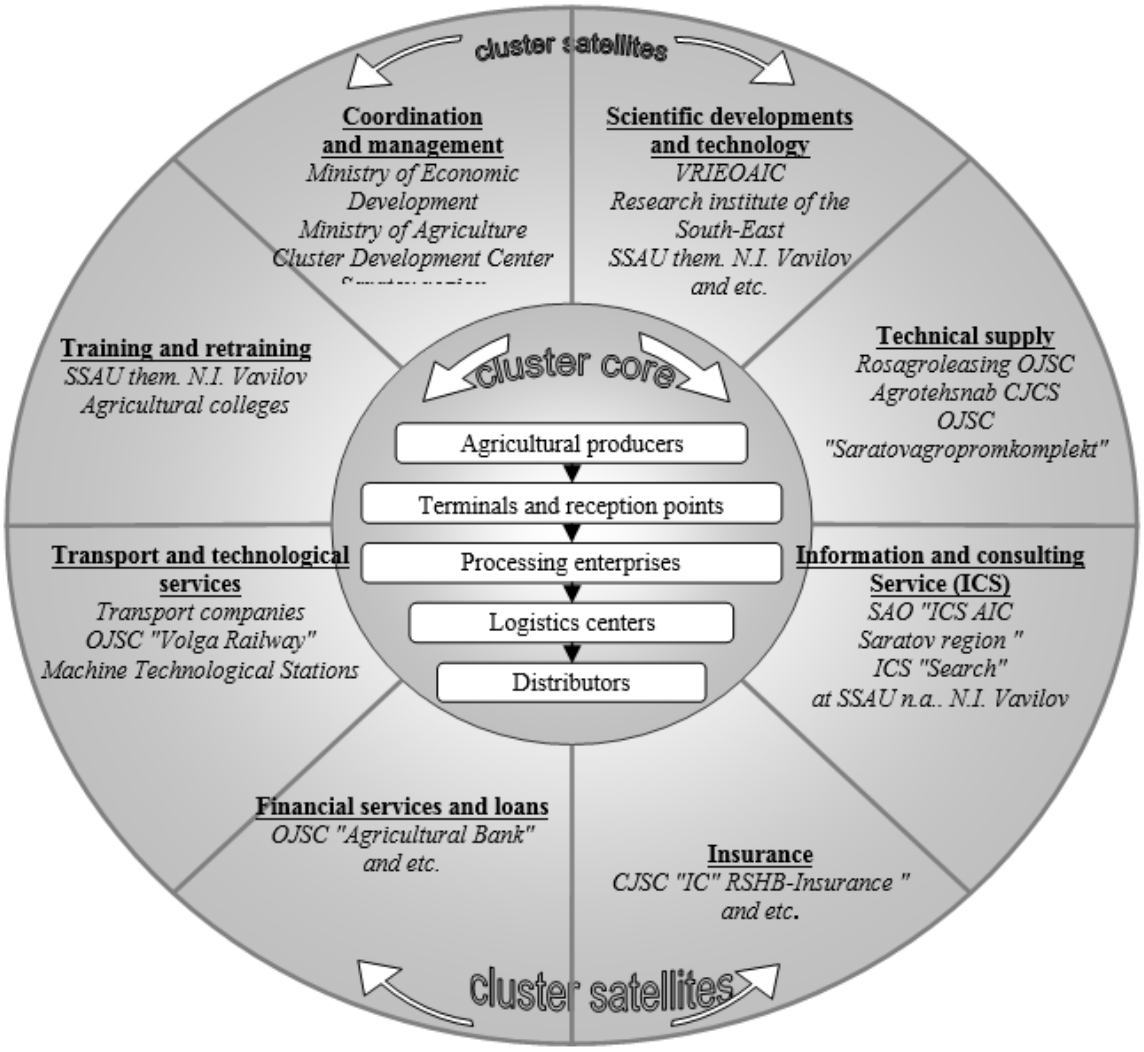


Fig. 5. Possible structure and composition of the agro-industrial cluster on the example of the Saratov region
Source: Compiled by the authors

Also, as part of our research, model projects of a number of documents were developed, such as the regional Concept and the Target Program for the Development of Agro-Industrial Clusters until 2030, the Charters of the Cluster Development Fund and Associations of Agro-Industrial Clusters, as well as agreements on cooperation between enterprises. These developments will significantly simplify and accelerate the implementation of cluster policy in the regions, significantly saving the financial and time resources created by the Cluster Development Centers.

CONCLUSIONS

As a result, it can be noted that currently in Russia there are active processes of clusterization of various sectors of the economy. The agro-industrial complex, where over the past 10 years dozens of cluster projects have been developed, is not far behind. However, studies of the development of cluster activity allow us to say that, despite the initial surge of interest in agro-industrial clustering, not many clusters were realized in practice. As of today, out of 41 agro-industrial clusters (the leader in the EU - Greece has 36 clusters), only 6 actually work, which corresponds to the level of Belgium (5 clusters in the agro-industrial complex). One of the reasons for this situation was the not fully understood essence of the clustering processes, the neglect of the principles and methods of building cluster structures. The main difficulties include: the lack of a unified methodology for identifying competitive

industries (protoclusters), a mechanism for forming and a model of cluster functioning, a non-optimal distribution of powers at the public and private levels, not always a reasonable choice of enterprises of the participants, as well as not enough developed regulatory framework. Nevertheless, the existing isolated examples of functioning clusters demonstrate all the advantages of these structures, confirming the correctness of the chosen direction of development of the agro-industrial complex.

The developed organizational and economic mechanism of formation and the order of development of cluster activity will allow optimizing and speeding up the process of creating clusters. The proposed organizational and economic model of functioning of the agro-industrial cluster, reflecting the main commodity-cash flows and the organizational and legal forms of the participants, will make it possible to more accurately design the structure of future clusters. Formation of the organizational structure and a certain standard set of enterprises will also help to save resources during preparatory clustering work. This will increase the feasibility of cluster projects at least twice, from today's 14.6% to 29.2%.

The widespread proliferation of clusters in the agro-industrial complex of Russia will contribute to increasing the efficiency and competitiveness of participating enterprises. And the presence of successful agro-industrial enterprises by creating jobs and increasing tax deductions will be the basis for improving the economic standard of living in the countryside. And given that agricultural production and consumer cooperatives are among the important participants in the clusters, the development of cooperation will contribute to the restoration of the IFH - peasant (farmer) and personal subsidiary farms. It was precisely small forms of management that were the basis for the survival of rural residents during the period of economic reforms of 1990–2000 and the provision of food to the population. In this case, one should take into account the main final effect from the development of cluster production - increasing the provision of consumers with food products in the required volumes and quality. Expanding the range, including through new and innovative types of products produced by clusters, will help to increase customer satisfaction, and ultimately improve the quality of life of the entire population of the country.

REFERENCES

[1]Aleksandrova, L.A., Matveeva, O.V., 2014, Institutional approach in clustering researches. Agrarian scientific magazine, 10. 65–69.

[2]Chernjaev, A.A., Serdobintsev, D.V., 2013, Features of formation and functioning of regional agroindustrial clusters in the Russian Volga region. Agromarket Problems, 3. 13–20.

[3]Dreving, S.R., 2009, Essence and the basic forms of a clusterisation of economics. Problems of modern economics, 2. 38–41.

[4]Enright, M., 1993, The Geographical Scope of Competitive Advantage. Stuck in the Region? Changing scales for regional identity. Utrecht. 87–102.

[5]Herrmann, F.F., Avila, L.P., Filippi, E.E., Sellitto, M.A., Dias, M.P.F., Coelho, D.M., 2017, Local productive clusters for food family agro-enterprises: evolution of strategic dimensions, Interciencia, 42 (8): 529–535.

[6]Ivanova, O.P., Antonov, G.D., Shabashev, V.A., Zobova, L.L., Nesterov, A.Y., 2017, Formation of agro-industrial cluster on the priority social and economic development area of the mono-industry town, Foods and raw materials, 5 (1):192–204.

[7]Kozhakhmetova, G.A., Dulatbekova, Z.A., Mukhiyayeva, D.M., 2017, Creation of Innovations-Oriented Clusters in the Sphere of Agro-industrial Complex as a Perspective Direction of Foreign Economic Cooperation of Russia and Europe. In: Uncertainty of Institutional Environment as a Tool of Global Crisis Management. Conference on Overcoming, Athens, Greece, Apr., 2017, Contributions to Economics. 589–596.

[8]Macroeconomic dynamics of Northern regions of Russia. In: V.V. Fauser (Eds) Syktyvkar: Komi a centre of science Urallsky Branch of the Russian Academy of Sciences. 2009. 336 p.

[9]Maskell, P., Lorenzen, M., 2004, Firms & Markets, Networks & Clusters: Traditional & Creative Industries. DRUID Winter Conference Paper. http://www.druid.dk/uploads/tx_picturedb/dw2004-958.pdf?q=music-clusters, Accessed on March 22, 2013.

[10]Ministry of Economic Development in 2016 will expand the program of support of territorial innovation clusters.
http://economy.gov.ru/minec/about/structure/depino/20160220, Accessed on February 15, 2017

[11]Novikov, I.S., 2017, Organizational-legal aspects of creation and functioning of agrotechnoparks. Agrarian scientific magazine, 7. 94–96.
[12]Palyvoda, O. M., Plavan, V. P., 2016, Assessment of synergies in forming of cluster organizational structures// Economic Annals-XXI, Vol. 158, Issue 3-4(2): 48–51.
[13]Patias, T.Z., Bobsin, D., Gomes, C.M., Liszbinski, B.B., Damke, L.I., 2016, Family agro-industry clusters from the social innovation perspective, RAM. Revista de Administração Mackenzie, 17(6):191–215.
[14]Pilipenko, I.V., 2007, Clustering policy in Russia. Society and economics, 8. 28–64.
[15]Porter, M., 1990, The Competitive Advantage of Nations. London: Macmillan. 875 p.
[16]Porter, M., 1998, On Competition. Cambridge: Harvard Business School Press. 485 p.
[17]Porter, M., Ketels, C., Delgado, M., Bryden, R., 2007, Competitiveness at the Crossroads: Choosing the Future Direction of the Russian Economy. http://www.isc.hbs.edu/pdf/Russia_Competitiveness_Crossroads_Dec2007.pdf, Accessed on September 25, 2013.
[18]Rosenfeld, S., 1997, Bringing Business Clusters into the Mainstream of Economic Development //European Planning Studies, Vol. 5. Is. 1. № 1. 3–23.
[19]Serdobintsev, D., Aleshina, E., Matveeva, O., Chernoshvets, N., 2014, The international and domestic practice of support of clustering initiatives in agro-industrial complex. International agricultural magazine, 6. 19–21.
[20]Storper, M., 1997, Territories, Flows, and Hierarchies in the Global Economy: Spaces of Globalization: Reasserting the Power of the Local. New York: Guilford Press. 157 p.
[21]The Ministry of agriculture of Russia held a meeting on the «all-Russian field Day» in the Altai region – the Ministry of agriculture of Russia, http://mcx.ru/news/news/show/52652.355.htm, Accessed on June 8, 2017.
[22]Vasylieva, N. K., 2016, Cluster models of households' agrarian production development // Economic Annals-XXI: Volume 158, Issue 3-4(2). 13–16.
[23]Zavorotin, E.F., Yurkova, M.S., Serdobintsev, D.V., Likhovtsova, E.A., Voloshchuk, L.A., 2018, Perfecting the cluster development in the regional dairy products subcomplex of the russian agro-industrial complex. Journal of Environmental Management and Tourism, T. 9. № 5 (29). 957–964.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE ROLE OF SOCIAL FARMING FOR SUSTAINABLE RURAL DEVELOPMENT IN BULGARIA

Mariyana SHISHKOVA

Agricultural University-Plovdiv, 12 Mendeleev Boulevard, Plovdiv, Bulgaria, Phone: +35932654453, Mobile: +359897 68 55 01, Email: mariyana.shishkova@gmail.com

Corresponding author: mariyana.shishkova@gmail.com

Abstract

The concept of social farming has gained wide popularity in Bulgaria over the last decade. A number of authors emphasize the importance of this concept for social inclusion and economic empowerment of vulnerable groups of society. Social farming contributes to increasing the level of social capital of the representatives of these groups, provides employment and allows them to become independent economic units. The aim of the study is to show the potential of social farming for achieving sustainable results in the rural areas of Bulgaria, based on the analysis of a network of organizations implementing an integrated model for small business support among disadvantaged families. The study applies social network analysis and case study methods. The results confirm the importance of the concept in addressing major rural problems. Some challenges for social farming have been outlined. Conclusions and recommendations have been made on policies in the area concerned.

Key words**:** *social farming, entrepreneurship, sustainable development, rural areas*

INTRODUCTION

The EU's rural areas are an important part of its identity. According to Eurostat in 2017, Bulgaria is the EU Member State with the highest percentage (38.9%) of the population at risk of poverty and social exclusion [5]. The relevant indicator in the rural areas of the country, which cover a significant part of the territory and a large percentage of the population, reaches almost 52 %. What is more, in these regions 31.2% of young people aged 18-24 are neither in employment nor in education or training [5]. Hence the problems in rural areas of Bulgaria are deeper and harder to overcome.

The circle of declining rural regions proposed by OECD describes the main obstacles to rural development. This circle begins with a low population density, which in turn is a prerequisite for a lack of critical mass in terms of infrastructure and services. That leads to relatively limited business activity and creation of fewer jobs in the region. Labour market problems generate migration processes which, in combination with aging populations, aggravate the problem of its density closing the circle of decline [13].

In this regard, stimulating entrepreneurial activity is among the possible solutions to overcome the challenges facing rural areas. At the same time, Kabeer et al. [9] points out that providing only access to finance is not enough for overcoming poverty. The authors emphasise that processes need to be accompanied by population empowerment activities.

Different tools and programs have been developed and implemented for this purpose, including Rural Development Programme (e.g. LEADER/ CLLD approach). The negative side is that the various program measures require the availability of a certain initial capital, which often the applicants gain through loans. Vulnerable groups in society however have difficult access to financial resources. In addition, Beluhova-Uzunova et al. [1] have stressed that "small farms, are essential for the sustainable development of rural areas and struggling against poverty".

The latter determines the need to develop different models and initiatives to cover the gap.

A number of studies have come to the conclusion that social farming has a great potential in the relevant sphere [11, 19].

Although the concept is characterized by the lack of a uniform definition and a broad interpretation of the term, the common features across them exist.

There are different approaches to the application of social farming: in the form of additional services offered by farms; providing employment or being carried out by NGOs for supporting entrepreneurial activity among isolated communities.

The following definition was adopted within the current study: "creating better conditions for people from disadvantaged groups to become independent economic units" [6, 17].

The aim of the present study is to outline the potential of social farming to achieve sustainable results in rural areas of Bulgaria, based on an analysis of a network of organizations implementing an integrated model for supporting small businesses in rural areas. In order to achieve the goal, the study goes through the following stages: (1) case study of a good practice in Bulgaria; (2) building the network of organizations and analysing the level of structural social capital; (3) outline the main challenges for social farming implementation in Bulgaria and (4) formulating recommendations for policies in the relevant area.

MATERIALS AND METHODS

The following methods for collecting, processing and analysing information are applied in the study: participatory observation, in-depth interview, document analysis, social network analysis and case study method.

The participatory observation covers the implementation of the Model under consideration, as well as part of activities under the two Social Farming projects involving Bulgaria as a partner. In addition the following main sources of information are used: Eurostat databases, the Central Register of Non-Profit Legal Entities [12]; official websites and publications of surveyed organizations.

The network is built on direct relation between organizations for the 2014-2018 period. Ties are valued. In regard to social network analysis, the UCINET 6 software package is used to calculate the degree centrality and betweeness centrality measures [8]. The dynamics of network density is also evaluated.

Within the study non-governmental organizations (NGOs), directly supporting social framing activities are considered, as well as several partner organisations involved in the process. The NGOs are functioning in the districts of Plovdiv, Razgrad, Kyustendil, Pazardzhik, Stara Zagora, Vratsa, Vidin, Yambol, Veliko Tarnovo and Burgas.

The dynamics of network density makes it possible to draw conclusions about the changes in the level of structural social capital.

RESULTS AND DISCUSSIONS

The analysis of the projects implemented in the field of social farming in Bulgaria revealed that among the most wide-ranging initiatives related to socio-economic empowerment is a Model implemented by the Land Source of Income Foundation [19, 16 and 7].

This integrated model supports small business initiatives of isolated communities. Its aim is to make families/ households independent economic units integrated into the existing socio-economic system [14]. Although the Model was created more than 20 years ago, it is constantly evolving through years. The main elements included are: 1) the development of human capital and 2) the provision of access to tangible assets as well as enhancing the employment opportunities. The presence of these two components is one of the main prerequisites for overcoming poverty in rural areas [15, 17].

The human capital development component of the Model includes not only tools for acquiring knowledge and skills to start own business, but also important elements concerning the development of the social capital of local communities and the program participants themselves – e.g. to change attitudes towards the problems of disadvantaged groups, building trust, etc.

The second component of the model, which concerns the provision of access to tangible assets, is based on three main schemes for the purchase of: 1) land, 2) LTA, and 3) STA [10].

It is important to underline that each of these schemes provides for own contribution in a different form and reimbursement of the allocated funds. Positive results from the implementation of the model are a good prerequisite for its dissemination in other regions of the country.

In 2011, the organization began to share its experience with other NGOs in Bulgaria to expand the outreach of the supported families. Initially 8 organizations with expertise in different fields were included. Some of them have experience in the application of financial schemes, others – do not. The second type of organization performs activities in the field of social empowerment of disadvantaged groups and those related to advocacy. Only one of the partners has been active in both directions.

Through the dissemination process it has been found that among the most important elements for the successful implementation of the model are: 1) the access to the community and 2) the built trust [10]. For this reason, despite the experience of implementing financial schemes, organizations that did not have such access failed to support economic initiatives.

After the completion of the first stage of the dissemination process three of the organizations dropped out, other two became associated partners. On the next stage Foundation started to seek for new partners. The process was assisted by the positive results in the dissemination regions.

Since 2014, the number of official partners implementing the Integrated Model of the Land - Source of Income Foundation has become five. Their territorial distribution is relatively good and allows support for vulnerable groups from different regions of the country. This is why the respective year is selected for the beginning of the study period.

The network of organizations, besides the mentioned six NGOs, includes several other partners which have helped the coordination of the activities, their promotion and the support of beneficiaries in the more remote areas. The main activities performed by the organizations concerned outside the applied model are related to social support, education, advocacy, mediation of access to health services, provision of employment, etc.

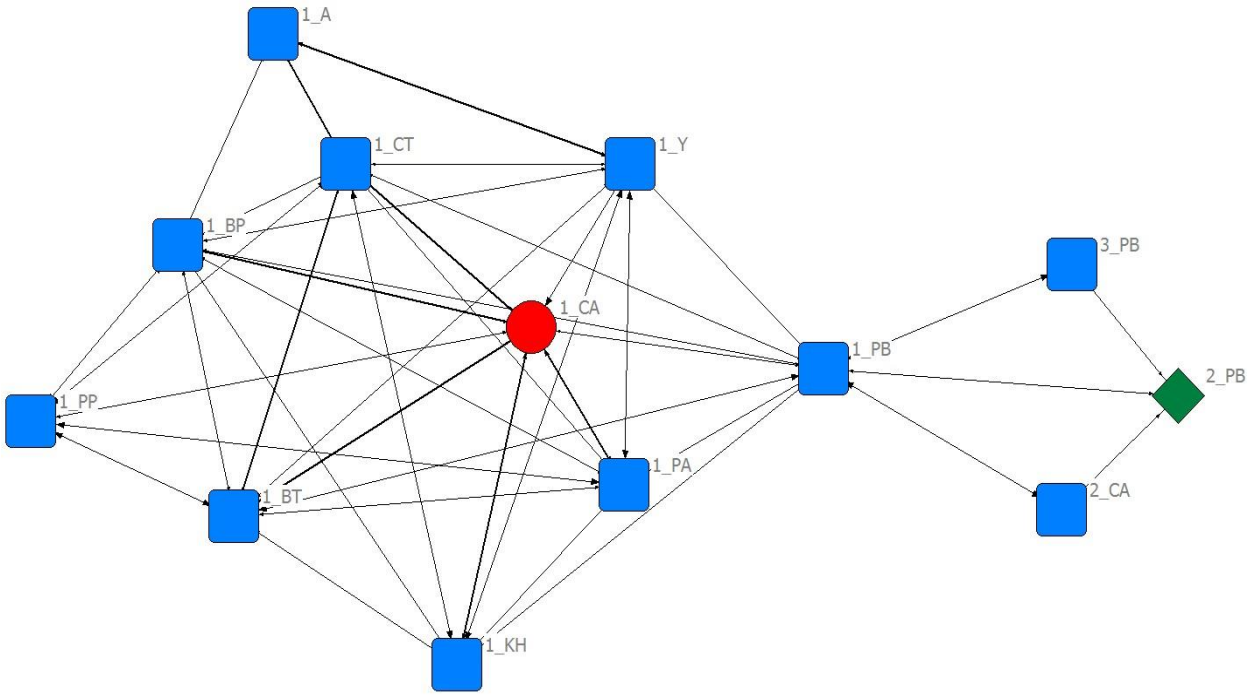


Fig. 1. Network of NGOs implementing activities in the field of social farming, 2018
Source: Own research.

In 2014 the NGOs implementing the Model supported 117 families, with over € 31,000 provided by the five partner organizations for the 27 economic initiatives [10]. It is important to emphasize that, while a major part of the initiatives of the Land - Source of Income Foundation refers to agricultural activities (purchasing of land and tangible assets), several non-agricultural initiatives have also been implemented with the help of partner organizations. Nevertheless, the latter are important for promotion of social farming activities. In 2018, the total number of families that NGOs supported during the implementation period reached 276.

Figure 1 graphically presents the network of organizations supporting initiatives in the field of social farming. Ties are defined on the basis of their joint project work. The network includes fourteen organizations. In the sociogram the NGOs are notated with a blue square, the donor organization with a red circle and the educational institution (Agricultural University) with a green diamond.

Table 1. Descriptive statistics

N	Indicator	Degree Centrality	Betweenness Centrality
1	Mean	9.07	6.21
2	Std. Deviation	6.34	13.92
3	Variance	40.21	193.82
4	Minimum	0.00	0.00
5	Maximum	20.00	55.17
6	Number	14.00	14.00

Source: Own research

The results of the analysis show that the average number of connections available to one organization in the network is 9.07 with a minimum number of these connections 0 and a maximum of 20 (Table 1). The latter is determined by the cooperation of the several organisations on more than one project. Nevertheless there is an organization that has not worked in partnership with other NGOs thought this year.

Network centralization is 24.52%. In general the lower values of this indicator are preferred as they reveal the lack of significant concentration of connections in individual participants. In this case the indicated percentage is relatively low.

For the betweenness centrality indicator, the average extent to which an organization performs a mediating function or falls on the shortest path between two other organisations is 6.214 with a standard deviation of 13.922.

On the other hand, the Network Centralization Index is 33.79%, which signifies that there are actors with relatively more power than others. In other words, theoretically organizations with higher mediatory role may limit the actions of other network participants.

Table 2. Test for a difference in density in time

Year	2018	2014
Density	0.24	0.19
Variance of ties	0.20	0.15
Estimated Bootstrap SE (10 000 samples)	0.07	0.07
T-statistics	1.98	
P(T<=t) two-tail	0.04	
P(T<=t) one-tail	0.04	

Source: Own research

The results for the network based on the relations of joint activities among organizations in different fields, do not reveal a statistically significant difference in network density in 2018 compared to 2014.

In this respect, a comparison is made in regard to the performed activities in the sphere of social farming. The results of the Bootstrap Paired Sample T-Test are presented in tabular form (Table 2). This approach is carried out with a number of 10,000 sub-samples. A one-tailed test is applied. The formulated null hypothesis states that there are no differences in the density of network ties at the beginning and at end of the period. The alternative hypothesis assumes that density increases over time. Since the data are valued, the hypothesis testing aims to determine whether there is a change in the average strength of the relations between actors.

The network density in 2018 and 2014 is 0.24 and 0.19 respectively. In other words at the end of the period the average strength of

network ties increased by 0.05 compared to its beginning. There is a greater variation in the connections in 2018 (0.20) compared to 2014 (0.15).

The p-value (0.04) is below the chosen level of significance $\alpha = 0.05$ and the null hypothesis can be rejected. This means that there is sufficient reason to state that the average strength of network ties in 2018 exceeds those of 2014. Therefore the level of social capital available to organizations in the network is increasing.

Previous own research reveals that a higher level of social capital helps to attract financial resources and to extend the scope of beneficiaries [17]. On this basis it can be stated that the activities carried out by the organizations are efficient prerequisite for the sustainable development of the rural areas.

Among the main challenges that hinder the rapid development of social farming in Bulgaria is the lack of sufficient legal basis. The results of the survey indicate that the majority of the organizations in Bulgaria carrying out activities in this sphere are representatives of the non-governmental sector. According to FASST [7] "the great unexplored and unexploited potential of social farming for social inclusion, employability and rural development is undermined by the lack of a coherent regulatory framework and definition at EU and national levels". Underdeveloped legislation also does not stimulate farmers to provide typical social farming services: rehabilitation-care activities, social care activities, etc.

Another often highlighted challenge is the lack of sufficient funding for NGOs [2]. This is partly due to the withdrawal of some international donors from the country as well as support for other types of entrepreneurial activity. Possible sources of funding can be microfinance institutions; EU programs (especially RDP of each Member State), other national programs, etc.

The optional microfinance and social entrepreneurship funding opportunities at the European level include: different microcredit providers and social enterprises financiers supported by the Microfinance and Social Entrepreneurship axis of the EU Employment and Social Innovation Programme [3]; other microcredit institutions, etc. In addition the EVPA [4] has systemised the following EU funding for social entrepreneurship: European Social Fund, European Fund for Strategic Investments; Social Accelerator; European Social Innovation Competition.

Similar to those sources of funding, even if not directly mentioned, people and organizations performing social farming can receive support under the Rural Development Programmes measures. Several countries have developed special documents that reveal the place of social farming in the RDPs as well as other funding opportunities (e.g., Italy [18], Czech Republic, etc.).

CONCLUSIONS

Based on the results of the study the following conclusions and recommendations could be highlighted.

The level of structural social capital of the surveyed organizations has increased over time. This means that new relations are created between the organisations and joint activities are implemented, as well as information and experience exchange are carried out. The latter is a prerequisite for facilitating and accelerating processes in the field of sustainable development.

One or more network organizations perform a mediating function in the field of social farming. To overcome this problem expansion of the collaboration activities among NGOs are recommended such as: training development at national level, enhancing the number of experience exchange events for the supported families and better advertisement. Some of those activities organizations already apply but they need more financial resources.

Support for the implementation of social-farming activities is not sufficiently attractive to engage a large number of farmers in this area. Developing good normative regulation is also essential. In the Member States where this has already been done, social farming is an additional source of income and helps

owners of agricultural holdings to achieve good financial sustainability.

At the European level, there are a number of funding options for the initiatives under consideration, one part are directly orientated for entrepreneurs, others require intermediaries. However, they all have to be supplemented by the development of the human and social capital of actors involved in the processes to accomplish sustainable results.

REFERENCES

[1]Beluhova-Uzunova, R., Atanasov, D., Hristov, K. 2017, Analisys of Direct Payments Distribution In Bulgarian Agriculture. Trakia Journal of Sciences, Vol. 15(1):286.

[2]Bulgarian Centre for Not-for-Profit Law, 2018, Sustainability Index of Bulgarian NGOs for 2017. http://bcnl.org/analyses/indeks-na-ustoychivostta-na-nepravitelstvenite-organizatsii-v-balgariya-prez-2017-g-.html, Accessed on 10.02.2019.

[3]European Commission, n.d., Employment, Social Affairs and Inclusion Programme. https://ec.europa.eu/social/main.jsp?catId=1084&langId=en, Accessed on 20.02.2019.

[4]European Venture Philanthropy Association (EVPA),2017,https://evpa.eu.com/uploads/publications/EU_Funding_for_Social_Entrepreneurship_Overview_May_2017.pdf, Accessed on 20.02.2019.

[5]Eurostat database, 2019, People at risk of poverty or social exclusion. https://ec.europa.eu/eurostat/statisticsexplained/index.php/People_at_risk_of_poverty_or_social_exclusion, Accessed on 02.02.2019.

[6]Formazione per Agricoltura Sociale e Sviluppo Territoriale, FASST, 2018a, Presentation on General Overview of Social Farming, third slide.

[7]Formazione per Agricoltura Sociale e Sviluppo Territoriale, FASST, 2018b, IO2 - Capacity Gap Assessment - Final Report. Developed under the project№2017-1-IT01-KA202-006055.p.3,p.26, http://www.fasstproject.eu/pdf/FASST_IO2_Final_Report.pdf, Accessed on 20.12.2018.

[8]Freeman, L., 1979, Centrality in social networks: I Conceptual clarification. Social networks. Vol.1:215-239.

[9]Kabeer, N., Mahmud, S., Castro-Isaza, J.G., 2012, NGOs and the Political Empowerment of Poor People in Rural Bangladesh: Cultivating the Habits of Democracy? World Development, Elsevier, vol. 40(10): 2044-2062.

[10]Land Source of Income Foundation (LSIF), n.d., http://www.landsourceofincome.org/, Accessed on 05.03.2019.

[11]Ministry of Agriculture of the Czech Republic, 2015, Social Farming. A document prepared in the framework of the Working Committee for Social Farming in the Ministry of Agriculture of the Czech Republic. http://www.netzp.cz/web_files/Social-Farming.pdf, Accessed on 21.01.2019.

[12]Ministry of Justice Central Register of Non-Profit Legal Entities, n.d., http://www.justice.government.bg/, Accessed on 02.02.2019.

[13]Organisation for Economic Co-operation and Development (OECD), 2006, The new rural paradigm: policies and governance, OECD Rural policy Reviews, ISBN:9789264023918, http://www.oecd.org/cfe/regional-policy/thenewruralparadigmpoliciesandgovernance.htm Accessed on 02.02.2019.

[14]Penov, I., Georgiev, G., 2014, Roma Income Generation and Integration Project Case Study Submitted for the Decade of Roma Inclusion International Workshop Economic Empowerment of Roma.http://presenciagitana.org/roma-economic-empowerment-cases.pdf, Accessed on 03.01.2019.

[15]Penov, I., Georgiev, G., Grigorova, D., Trendafilov V., 2012, An Integrated Model for Supporting Small Business or How to Help Disadvantaged Families to Generate Income From Own Business. Makros Printing House. Plovdiv, Bulgaria.

[16]Profarm, 2017, Social Farming In Europe. PROfessional and personal empowerment in social FARMing. Project number 562159-EPP-1-2015-1-IT-EPPKA3-PI-FORWARD. http://www.egina.eu/documents/Del%203.1%20Social%20Farming%20in%20Europe.pdf, Accessed on 15.12.2018.

[17]Shishkova M., 2017, Dissertation on Doctoral Thesis: The Role of Social Capital for Sustainable Rural Development. Defended at the Agricultural University – Plovdiv. (In Bulgarian).

[18]Social Farming in Italian Rural Development Programmes 2014-2020, https://www.reterurale.it, Accessed on 03.02.2019.

[19]Social Farming, Social Impact Project Booklet, 2018,http://sofiproject.org/wp-content/uploads/2018/08/Presentation_Bulgaria_MeetingBulgaria_October2017.pdf, Accessed on 03.02.2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

ANALYSIS OF TOURISM IN ALBA COUNTY IN 2018

Andora Evelina SIMINA, Manea DRĂGHICI

University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile:+40787654891, Emails: evelinasimina@yahoo.com, dmprofesor@hotmail.com

Corresponding author: evelinasimina@yahoo.com

Abstract

The beauty of an area is revealed by spending time on those lands. By practising various forms of tourism (tourism in mountain resorts, spa resorts, circuit, rural tourism, urban tourism), the traveler can enjoy the wonders of nature (waterfalls, caves, quays, karst springs, etc.) as well as the cultural creations, the traditions and customs of the place it prides itself on. Alba county is endowed with a diversified tourist potential that attracts tourists from all corners of the world in any season, providing accommodation in both urban and rural areas, with an increase in accommodation capacity between 2015 and 2018, which is a gratifying thing.

Key words**:** *Alba, tourist potential, accommodation capacity, tourist reception structures*

INTRODUCTION

Every field has a more distant or closer beginning, as in the case of tourism, which, according to some authors, "has begun to exist since the distant days of Herodotus, Pytheas, Hannon, or the time of great geographical discoveries when "Marco Polo, Magellan, and Columbus were tourists" [7] and other authors consider the 19th century to be the beginning of the organized tourist movement when it became a mass phenomenon. Neguţ S. speaks of the "tourist explosion" influenced by "demographic explosion, urban explosion, economic growth, special development of ways and means of transport, facilities regarding accommodation, food, rest, recreation, treatment, impetuous growth of the media which has a decisive role in the dissemination of tourism information on a planetary level." [7]

Nowadays, tourism is "a large-scale economic activity and a well-shaped and influential aspect of social life", [9] representing "a permanent and huge migration of people and an infinite number of commercial, technical and intellectual operations" [9] .

"The main features of contemporary tourism are:

(i)increasing its mass character by engaging a major share of the population of a country. Worldwide, it involves hundreds of millions of people;

(ii)increasing the travel rate at continental or intercontinental level (e.g. between Europe and America, Europe and Asia);

(iii)asserting itself by an ever-increasing volume, estimated at the level of tourism consumption, thus becoming, indeed, a basic branch of the economy of many recipient countries;

(iv)diversification of its types in accordance with the offer and especially with the requirements of the demand. The spa-curative, recreational tourism is often followed by cultural or sports tourism, transit tourism is associated with long-stay travel. New forms of tourism are emerging, such as: rural and ecological tourism, hunting tourism (safari);

(v)special mobility due to the improvement and diversification of the ways and means of transport;

(vi)emphasizing the social character by engaging the lower income population in such activities;

(vii)broad affirmation of holiday tourism, promoted especially among youth;

(viii)the naturalization of tourism by increasing the importance of resources belonging to the natural environment"[3].

Tourism has been born thanks to the desire to enrich oneself with new knowledge about

natural and anthropogenic beauties that to some extent influence you. But not every natural or man-made element is a facilitator of tourist attraction. Thus, "the world tourist potential represents the totality of the physical and geographical elements of a territory, which - by virtue of their value - exerts an attraction action on the potential tourists, thus facilitating the tourist exploitation of this space" [5].

The notion of tourist potential is established in the tourist offer and is closely related to the content of tourist services. We cannot talk about tourist potential without referring specifically to tourist services, offered in an increasingly diverse range and at the level of the preferences and exigencies of tourists and potential visitors. "Among the components of the tourist potential we have to mention, first of all, the natural resources (e.g. mountain and landscape beauties, seaside beaches, balneo-climatic resorts, climate, vegetation, fauna, other attractions of scientific interest with unique character). Natural values (the so-called primary offer) form the basis of the potential tourist offer of an area, considered fit to be introduced into tourist circuits. Natural resources (values) are complemented by anthropogenic man-made resources (values) (the so-called secondary tourist offer) designed to improve and facilitate rational valorization of natural tourist potential, providing the premises for transforming this potential offer into an effective tourist offer [6].

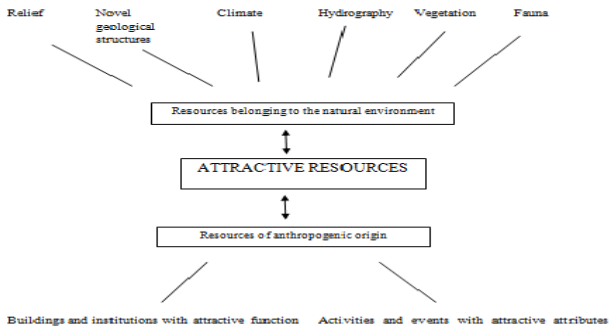


Fig. 1. Attractive resources for tourism
Source: [3]

Tourist attractiveness resources divided into natural resources and resources of anthropogenic origin are closely connected and complement each other. (Fig.1).

According to Neacşu *et al* (2006), the tourist potential of a country, area, could be defined as: "The totality of natural values and economic, cultural values that, as a result of human activities, can become landmarks of tourist attraction. It is about those values whose commissioning for tourist purposes requires improvement and fitting-out work, capital investment and a considerable amount of human labor expenditure"[6].

MATERIALS AND METHODS

The studied bibliographic sources have been useful to highlight the tourist potential in Alba county, which is meant to attract more and more tourists from one year to another, both in Mioritic regions and from different corners of the world.

The documentation, both bibliographically and on the field, by applying questionnaires on how tourism in Alba county works has revealed the tourist structures of this county which offers the tourist various accommodation units (hotels, motels, tourist villas, tourist cottages, bungalows, tourist guest houses, agrotourist guest houses).

Statistical data of the National Institute of Statistics have been the basis for the research of the dynamics of tourism and agritourism in Alba county in 2018, analyzing the capacity of tourist accommodation existing in the main types of tourist accommodation structures and overnight stays of tourists in the most relevant accommodation units.

RESULTS AND DISCUSSIONS

It is said that there are places where you know that you will return sometime, from the moment you see them for the first time, because in our being there is an inexplicable attraction to the beauty created by nature. This is what we can say about the places in Alba county, the heart-shaped county, in the central-western part of our country, with many natural and historical landmarks that greet you all the time and attract you

regardless of the season. Situated in an area with a diverse geographic environment, Alba county can enjoy many forms of tourism, taking into account the main destination, such as: mountain resort tourism, spa tourism, circuit tourism, urban tourism and rural tourism.

From an administrative point of view, Alba county has 11 cities, including 4 municipalities: Alba Iulia - county residence, Aiud, Blaj, Sebeş and 67 communes with 642 villages that have prepared for tourists 5,278 accommodation places in 204 tourist reception units classified in both urban and rural areas.

Analyzing the statistical data from the National Institute of Statistics on the number of tourist reception structures and the reception capacity existing in Alba county in 2018, there is a variety of accommodation possibilities for tourists according to the budget that they can afford to spend for accommodation.

The largest number of accommodation structures is in the rural area, with 119 classified agrotourist guest houses, with an accommodation capacity of 2,157 places.

Tourist guesthouses in a number of 29 units, spread both in urban and rural areas, provide 608 accommodation places for tourists. The hotels, consisting of 19 structures, are located predominantly in the cities of Alba county and have the possibility to accommodate tourists in 1,316 places.

In Alba county 12 tourist villas are classified with an accommodation capacity of 346 places.

Fig. 2. The main tourist reception structures in Alba county in 2018
Source: [1]

In the mountains there are 6 tourist cottages with 140 places available for hiking and mountain sports enthusiasts, being under the accommodation capacity of 234 places in the 6 motels in Alba county. The bungalows have 3 units with the possibility to offer tourists only 11 accommodation places.

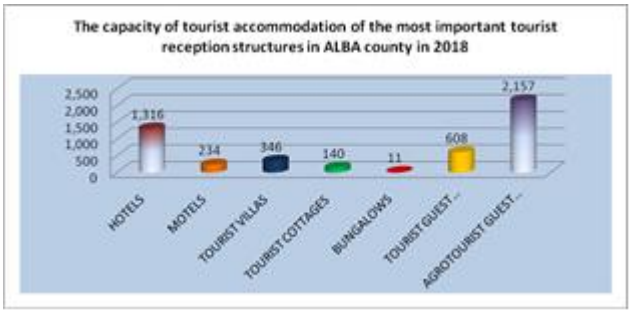


Fig. 3. The tourist reception capacity of the most important tourist accommodation structures in Alba county in 2018
Source: National Institute of Statistics, 2019 [11]

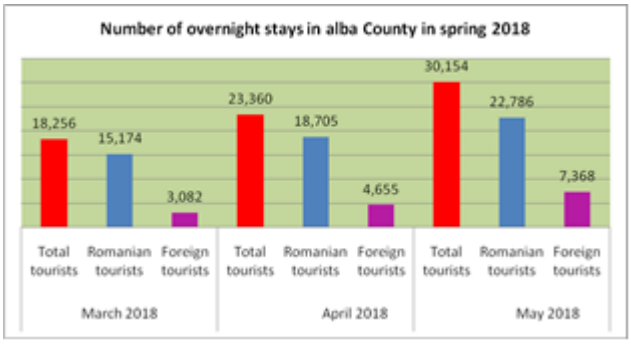


Fig. 4. Situation of overnight stays in Alba county in spring 2018
Source: National Institute of Statistics [11]

Comparing the data on the number of overnight stays in spring 2018 in Alba county, it is noted that the number of overnight stays in classified accommodation units is increasing in March by 18,256 tourists, in April by 23,360 tourists, and in May their number is 30,154, of whom 22,786 are Romanian tourists and 7,368 are foreign tourists. It is noticed that the number of overnight stays of foreign tourists is increasing, which is a good thing. (Figure 4)

The warm season, with many sunny days, determined both Romanian and foreign tourists to spend their holidays in Alba county, so in August the number of their overnight stays reached 56,314, out of whom 48,731 were Romanians and 7,583 were tourists from abroad. Also in June and July

there is an increase in the number of overnight stays in tourist reception structures compared to the previous months of the same year 2018. (Fig. 5).

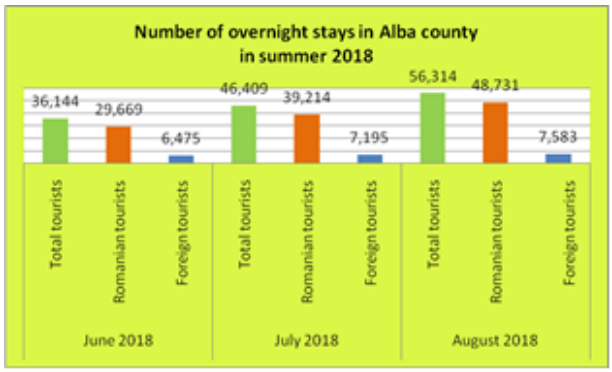


Fig. 5. Situation of overnight stays in Alba county in summer 2018
Source: National Institute of Statistics [11]

Analyzing the autumn season, September is the month when tourists come in larger numbers in accommodation units in Alba county. Thus, the number of overnight stays is decreasing, with 36,404 tourists in September, in October with 7,369 fewer overnight stays of tourists, and in November reaching 25,024, the number of overnight stays of Romanian tourists were 22,516 and of foreign tourists of 2,508. (Fig. 6).

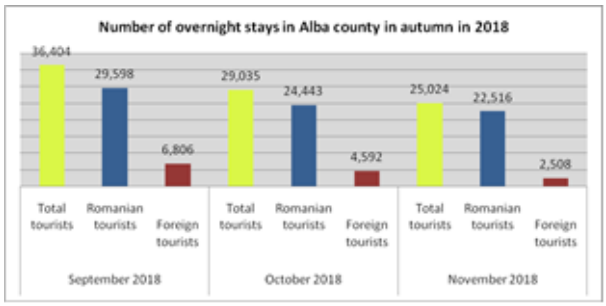


Fig. 6. Situation of overnight stays in Alba county in autumn 2018
Source: National Institute of Statistics [11]

In the winter season 2018, the number of overnight stays of those who have crossed the threshold of tourist accommodation units is influenced by the Christmas and New Year holidays. This is evidenced by comparing the number of overnight stays in December of 22,140 tourists, with the months of the beginning of the year 2018, when the number of overnight stays is 17,186 in January and 17,023 in February respectively. Analyzing the number of overnight stays of foreign tourists, it was found that in February they were 2,556, compared to 2,363 in the first month of the year or even in the last month, and in December the number of overnight stays of tourists from other countries reached only 2,360 (Fig.7).

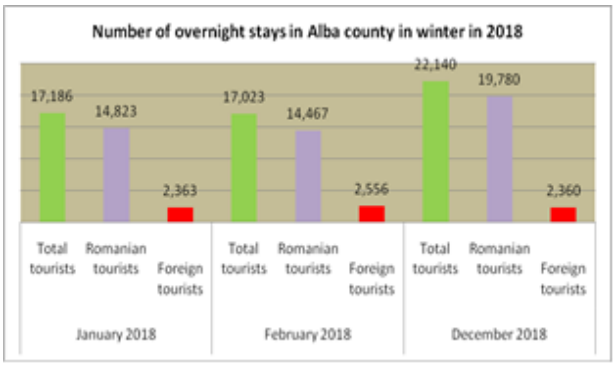


Fig. 7. Situation of overnight stays in Alba county in winter 2018
Source: National Institute of Statistics [11]

Comparing the statistical data, Alba county is visited by both Romanian tourists and foreign tourists throughout the year, both during the summer period when the number of overnight stays in classified tourist accommodation structures reached 56,314 in August 2018, out of whom 48,731 were Romanian tourists and 7,583 foreign tourists, and in off-season months such as May 2018, with 30,154 overnight stays, of whom 22,786 were Romanians and 7,368 foreigners, or in the autumn months when in September 2018 there was a total of 36,404 overnight stays of 29,598 Romanian tourists and 6,806 foreign tourists.

It is noted that rural accommodation structures are present in all Alba county, so rural tourism is well represented and requested by tourists regardless of their nationality.

Today, rural tourism is of particular importance. Retirement in an oasis of tranquility in the middle of nature is a haven for tourists wishing to escape from the everyday bustle of crowded cities. The French naturist Bonnefous believes that: "The mechanized inferno and the monotony of urban life make more and more townspeople want space, freedom of movement, nature. Being a prisoner of the city, man rediscovers

nature to liberate himself." (Edouard Bonnefous, "Man or Nature?", Political Publishing House, Bucharest, 1976, p. 153) [7].

Rural tourism has become a way of life, it is a trend of tourism industry development, being a solution to job creation in rural areas, generating additional income, thus contributing to raising the living standards of the rural population.

A new form of approach to rural tourism is agrotourism, which "comprises two major components: the actual tourist activity, materialized in accommodation, food services, recreation (travel, fishing, equitation), other current services, and on the other hand, the economic activity, mainly agricultural, provided by the owner of the agritourist guest house (farm), materialized in the primary production and processing of agro-food products in the household and their direct selling to tourists" [4].

Agrotourism is a particular form of tourism that aims to combine tourist activity with economic activity in host households. Agrotourism makes the natural and anthropic resources of the area more profitable, contributing to raising the living standards of the rural population. Unlike rural tourism, agrotourism involves: accommodation in the farmhouse, consumption of agricultural products in that household and participation to a greater or lesser extent in specific agricultural activities" [8].

Alba county has many areas where rural tourism and implicitly agrotourism are by far very popular. The Apuseni Mountains area, with the villages of the Aries valley, known as "Ţara Moţilor", boasts about "localities attested as tourist resorts of local interest Arieşeni and Albac" [10] and it is considered "the most developed area of Alba county" [2]. The Rimetea microregion, located in the northern part of the county, at the foot of the Trascau Mountains, has as a tourist center the Rimetea commune, which received the Europa Nostra Award in 1999. In the eastern part of the county, towards Sibiu county, there is Câlnic village, which is part of the UNESCO World Heritage.

CONCLUSIONS

No matter where you are traveling through Alba county you enjoy special beauties. If you come to Sebeş, it is advisable to discover the first Saxon fortress of Transylvania, then stop at Lancrăm at Lucian Blaga memorial house, where poetry and philosophy are everywhere. The tourist's itinerary can continue to Căpâlna Fortress, a UNESCO heritage monument, since 1999. The "Râpa Roşie" Geological Reservation is a rarity due to red clay "waves" alternating with gray gritstone. Tourists loving adventure and adrenaline can climb these red rocks to go paragliding.

Driving through the winding road of Transalpine and reaching the Sureanu Ski Area, at an altitude of over 2,000 m, you can enjoy during the whole white season 10 slopes arranged at European standards, with a total length of 18 km.

If you choose to wander the Apuseni Mountains you have a lot of options, regardless of the season. Tourists who are fond of the craving for caves have a variety of unusual karstic cavities, both with limestone stalactites and stalagmites, such as "Huda lui Papara" Cave, which is on top of world caves due to the largest colony of bats from Europe, as well as caves with ice formations, such as Scărişoara Cave, or Vârtop Glacier.

Waterfalls, quays and karst springs have their special beauty that enchants young and old travelers. For example, Pisoaia waterfall in Vidra de Sus, called "Bride's Veil", is a natural gift that charms you both in summer and winter, when water freezes and transforms the waterfall into a nacreous veil. The village of Vidra de Sus is the place where the "King of the Mountains" was born - Avram Iancu, mentioned in the 1848 documents which are exhibited in the memorial house "Avram Iancu".

Pilgrimage through Alba county should include Alba Iulia, a county residence with many landmarks. The best preserved medieval fortress and the largest in Transylvania, Alba Carolina, built in Vauban style, is here. Important moments in our people's history have left their mark in this city. Thus, here

took place the first union of Romanian Countries in 1600, by Mihai Viteazu, being from that time a wooden church. Here, Horea and Cloşca were imprisoned and then pulled on the wheel and even today the Obelisk and the Forks' Hill can be seen. In the Catholic Cathedral is Iancu de Hunedoara's tomb. Also in this city was the Grand Union of 1918 and in 1922 King Ferdinand and Queen Mary were crowned in the Reunification Cathedral as kings of Greater Romania.

The tourist potential of Alba county, which meets the requirements of any tourist, is promoted whenever possible through the participation of tourism operators, tourism service providers, representatives of NARECT Alba (National Association of Rural, Ecological and Cultural Tourism), the Alba County Council, local councils and city halls at fairs and tourism exhibitions, such as the Romanian Tourism Fair organized in Bucharest and the National Rural Tourism Fair of Albac, which has a long activity, being at its 14th edition in 2018.

From the processed statistical data, it is concluded that Alba county has an accommodation structure that meets the needs of any tourist, whether from the country or from abroad, that it has sufficient accommodation capacity, yet with a perspective of improvement by continuously modernizing existing ones or classifying new tourist accommodation units.

REFERENCES

[1]Alba County Romania's map (Judeţul Alba, Harta României), https://pe-harta.ro/alba/, Accessed on 4.03.2019.

[2]Center Agency for Regional Development (Agentia pentru Dezvoltare Regionala Centru), ADR CENTRU, http://www.adrcentru.ro/lista.aspx?t=rcturism, Accessed on 4.03.2019.

[3]Cocean, P., Vlăsceanu, G., Negoescu, B., 2005, Tourism General Georgraphy (Geografia generala a turismului), Meteor Press Publishing House, Bucharest, pp. 48, 57.

[4]Creţu, R., Ştefan, P.M., 2017, Management of agrotourist resources (Managementul resurselor agroturistice), Lecture support.

[5]Mac, I., 1992, General tourist Georgrapghy (Geografia turistică generală), UDC Sibiu, pp.53

[6]Neacşu, N., Baron, P., Snak, O., 2006, Tourism Economy (Economia turismului), 2nd Ed., ProUniversitaria Publishing House, Bucharest, pp. 24, 26

[7]Neguț, S., 2004, Tourism georgrapghy (Geografia turismului), Meteor Press Publishing House, Bucharest, pp.5, 12, 20

[8]Stănciulescu, G., Lupu, N., *et al.*, 2002, Lexicon de termeni turistici, Oscar Print Publishing House, Bucharest, pp.14-15

[9]Tourism international Dictionary (Dicționar turistic internațional), 1980, Translation and adaptation in Romanian by Silviu Neguț, Sport Turism Publishing House, pp. 15, 16

[10]Tourism Ministry, Aythorized structures, http://turism.gov.ro/web/autorizare-turism/, Accessed on 4.03.2019.

[11]Tempo Online, National Institute of Statistics, http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table, Accessed on 4.03.2019.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

QUALITY ASSESSMENT IN HIGHER EDUCATION BASED ON SERVQUAL MODEL

Valentin ȘERBAN, Elena STOIAN

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax: +40213182888,
Emails: srbn.valentin@yahoo.com, stoian_ie@yahoo.com.

Corresponding author: srbn.valentin@yahoo.com

Abstract

This study investigates the perceptions regarding the quality of services within the Faculty of Management, Economic Engineering in Agriculture and Rural Development, questioning the students of the 4-th year of both specializations: Economic Engineering in Agriculture and Engineering and Management in Public Food and Agritourist. Students of the 4-th year were questioned, as we considered that they are final consumers of the educational service provided by the faculty. Following the study we were able to identify the improvement measures for each specialization. The students enrolled in IMAPA specialization have a lower level of satisfaction (are less satisfied) in each of the 5 quality dimensions and have a medium satisfaction level of 74%, compared to those from IEA specialization who have the medium degree of satisfaction of 79%. Both specializations require improvement measures, but priority is IMAPA;

Key words**:** *servqual, quality, perceptions, expectations, service quality*

INTRODUCTION

The services sector has grown considerably since the 1970s, and in present the services play an increasing role in the economy of many countries. In close relation with this trend, the services quality has become an extremely current problem. Providing a good services quality can be easily associated with increasing profitability, satisfaction, loyalty, customer keeping and attractiveness. Considering the existence of these obvious relationships, the increasing need to measure the quality of services raised. Despite the awareness of its importance, many researchers considered it difficult to define and adequate measure the quality of services [10] due to the unique features of services, particularly intangibility, inseparability, perishability and lack of ownership [9].

The faculty is by definition a didactic and administrative unit that provides educational services for the preparation in a certain field of students, master students and PhD students. According to the data published by the National Institute of Statistics in 2016, 560 faculties were in the university environment in Romania, of which 405 state, and the rest were private.

According to the trend of increasing tuition fees, the relatively large number of faculties and the fears of lowering the number of students, achieving a sustainable competitive advantage in the higher education sector should be at the top of all university agendas. In this way, Universities, through Faculties, can differentiate their educational offers by providing and improving the quality of the services provided.

MATERIALS AND METHODS

In the last three decades, a series of conceptual frameworks and models that try to measure the quality of services have been proposed [1,2,3]. Palmer argues that [7] the most efficient methods used to determine the quality of services are approaches regarding infirmation and performance. Moreover, the most commonly used methods used to measure service quality can be classified as multi-attribute quantitative measurements [1], for example SERVQUAL approach [10], SERVPERF approach and in the context of higher education, HEdPERF approach[1].

Among the approaches highlighted above, the most frequently quoted is SERVQUAL model. In addition, the development of SERVPERF model has encouraged the introduction of context-specific models for measuring service quality. Abdullah has developed the model only for performance in higher education (HEdPERF) [1]. The model is a comprehensive performance measurement scale that try to capture the determinant factors in the higher education sector.

The development of the SERVQUAL model has become a necessity to determine the perceived quality of customers [8,9,10,11]. Evaluation of service quality is essential. Like in the case of the quality of service perceived model, the infirmation model is used. In this case, the quality assessments perceived by clients result from a comparison of what clients think the organization should offer and how they perceive the performance of the organization that provides the service consider that the level of quality of service perceived depends on the magnitude of the differences between expectations and perceptions - the smaller the difference, the higher the quality of the services perceived.

As identified by Parasuraman, SERVQUAL model uses 22 statements [8]. A seven-point Likert scale is used to record expectations and perceptions [10] established that the model incorporates five dimensions (Fig. 1 and 2) in the quality of services:

1.”Tangible Elements - Appearance of physical facilities, equipment, personnel and communication materials”.

2.”Seriousness - Ability to perform the promised service faithfully and correctly”.

3.”Responsiveness - Desire to help clients and provide prompt services”.

4.”Assurance – The knowledge and ability of employees to inspire trust”.

5.”Empathy –Individualized attention, given to company clients”.

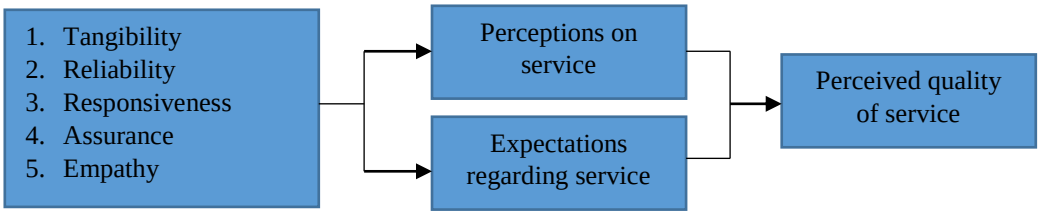


Fig. 1. Dimensions of service quality in SERVQUAL model
Source: [10]

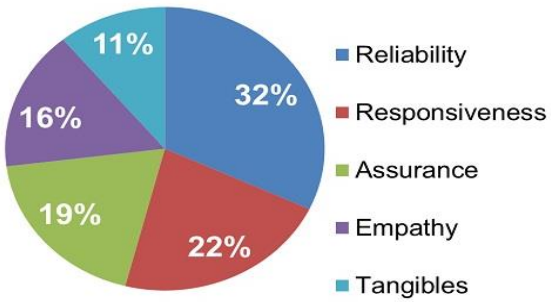


Fig. 2. Importance of the five dimensions according to SERQUAL model
Source [10]

Not all dimensions are equal. For clients each dimension is important, but not to the same extend. All service providers have to know why the service is not considered of ”quality”. At the same time they have to focus on all the dimensions. SERVQUAL research has shown the importance of dimensions, requiring clients to assign 100 points in all five dimensions.

RESULTS AND DISCUSSIONS

Adapting the SERVQUAL model for evaluating educational services

DeShields et al. (2005) said that it is crucial for higher education management to use market strategies as any economic agent. These principles and strategies are applied in higher education institutions in order to gain a competitive advantage [5]. As a result, institutions increasingly understand the importance of higher education as a service industry and emphasize the relationship between student expectations and their needs [4]. Nadiri et al. (2009) emphasizes that it is essential for higher education providers to

understand the students' needs, expectations and perceptions of what constitutes a quality service to attract and meet their needs. This promotes the need for higher education institutions to continue to offer quality service and satisfy their clients to achieve sustainability in a competitive service environment [4].

Taking into account the particularities of the educational service, it can be said that this is a pure service [6]. More recently, Gruber *et al.* (2010) asserts that higher education is a service that is predominantly intangible, perishable and heterogeneous. This is due to the fact that the experience of delivery service varies from one situation to another, which makes difficult to standardize the services provided by higher education institutions. Higher education as a service also meets the criterion of perishability, because it is difficult to maintain. However, the ways to overcome this issue are evident, for example, the emergence of e-learning technology and videoconferencing (Cuthbert, 1996a) in recent years. As a result, the service sectors, such as higher education, try to contradict the perishability character of a service through innovation and technological progresses.

Despite the characteristics of the educational service, it is important to understand that higher education institutions, like any other enterprises, have different stakeholders, with different interests and agendas.

SERVQUAL model has a wide area of applicability, with which it can measure the quality of any service. By adapting the twenty-two statements it can be personalized for the particularities of any service, but this characteristic can be considered a weak point (Table 1).

Taking into account those mentioned above, the present study was realized based on the SERVQUAL model by applying a questionnaire designed to measure the quality of educational services provided by the Faculty of Management, Economic Engineering in Agriculture and Rural Development of the University of Agronomic Sciences and Veterinary Medicine from Bucharest.

Before structuring the questionnaire, we set out the points to be evaluated within each dimension set by the model.

Table 1. Setting the statements within the dimensions according to SERVQUAL model

Tangibility	1	Endowment with modern equipments
	2	Maintenance of faculty infrastructure
	3	Deportment of professors and administrative staff
	4	Materials associated with the teaching process
Reliability	5	Professionalism of professors and administrative staff
	6	Training skills required in the labor market
	7	Showing willingness
	8	Objectivity and transparency in evaluation
	9	Publication of data and information without errors
	10	Rigorous keeping of records
Responsiveness	11	Prompt delivery of deadlines
	12	Compliance with schedule / program
	13	Promptness in solving problems
	14	Prompt answer to uncertainties and questions
Assurance	15	Teacher competence
	16	Modern teaching / learning methods
	17	Possibility of finding a job
	18	Focus on providing the best preparation
Empathy	19	Convenient work schedule
	20	Treating the student individually
	21	Politeness in the relationship with students
	22	Accepting improvement proposals

Source: SERVQUAL model adapting.

Structure of questionnaire

The questionnaire based on SERVQUAL model was structured in three parts.

First part – Importance of the quality dimensions;

Second part – Expected quality;

Third part – Perceived quality

In the first part of the questionnaire respondents had 100 points and were asked to distribute them to the quality dimensions set by SERVQUAL model. Each dimension has been described in order to understand exactly what each of them refers to. We consider that every individual perceives the quality of a service in a completely different way than the one next to him. For example: a student from a faculty with technical profile should give a higher score to the Tangibility dimension, while a student from a faculty with philological profile would give a lower score. In this way the structure of the importance of dimensions can vary greatly from a service to another, but also within the same service, taking into account of particularities and consumers.

In the second part of the questionnaire were found the 22 statements mentioned above, and

on a scale of 1 to 7 respondents were asked to express the level of expectations, namely what characteristics should have, according to their requirements, a quality service of education.
In the third part of the questionnaire the same 22 statements were found and, using the same scale, the respondents appreciated the quality of educational services provided by the faculty, as they perceived during the 4 years.

Applying the questionnaire

The questionnaire was applied to the students of the IV-th year of the two specializations, being considered as consumers to whom the service was provided in full. The sample was calculated to meet a probability of 95% and taking into account a maximum error of 5%.
Due to the non-homogeneous population (aspects related to each individual: different expectations, different perceptions, different preferences, seriousness, sympathy) a selective research could not be carried out in order to generalize the results for the whole collectivity. In this context, we chose the quick method of determination that starts from the volume of total collectivity (N) without taking into account the characteristics of the population (Taro Jamane expression):

$$n = \frac{\mathrm{N}}{1 + \mathrm{N} * e^2}$$

n – sample size
N – volume of total collectivity
e – generally accepted error threshold (5%)

Table 2. Setting up the sample size for each specialization

Specialization	N	e	n	Respondents
IEA	**128**	**5%**	**96**	**91**
IMAPA	**197**	**5%**	**131**	**141**

Source: Own calculations.

The size of the samples calculated using the Taro Jamane formula is in Table 2.

Determining the importance of categories in the quality of services

By averaging the values given to each dimension by the respondents, we found that there are no significant differences between the two specializations, but comparing them with the model, they deviate quite enough.
Respondents have established that the education service should be set up so:
- 22.5 % tangible elements – 5th place in the model structure (11%);
- 20.5 % assurance – 3rd place in the model structure (19 %);
- 20 % seriousness – 1st place in the model structure (32 %);
- 18.5 % responsiveness – 2nd place in the model structure (22 %);
- 18 % empathy – 4th place in the model structure (16 %).

Differences (GAP) were calculated by formula:

$$\boldsymbol{SQj} = \frac{\sum(\boldsymbol{Pij} - \boldsymbol{Eij})}{\boldsymbol{nj}}$$

where:
SQ - service quality for the dimension j; j=1…5
Pij - perceives for statement i of dimension j; i=1…22, j=1…5
Eij - expectations for statement i of dimension j; i=1…22,j=1…5
nj - number of statements from dimension j
The differences can vary between -6 and +6. Extreme positive values mark an optimal quality of services, while a negative value marks a low quality with various deficiencies.

Comparative analysis of the results obtained in the two specializations

Making a comparative analysis of the results obtained, we can see that the expectations are high and relatively equal in both specializations, but the perceptions are noticeably smaller in the IMAPA specialization, maintaining relatively the same structure as for IEA.
The coefficient of variation in the perception of quality shows the great differences in the appreciation of the same service, which can be explained by the possible connection with the frequency of the students at courses, the subjectivity in the evaluation, the uniqueness of the individual.

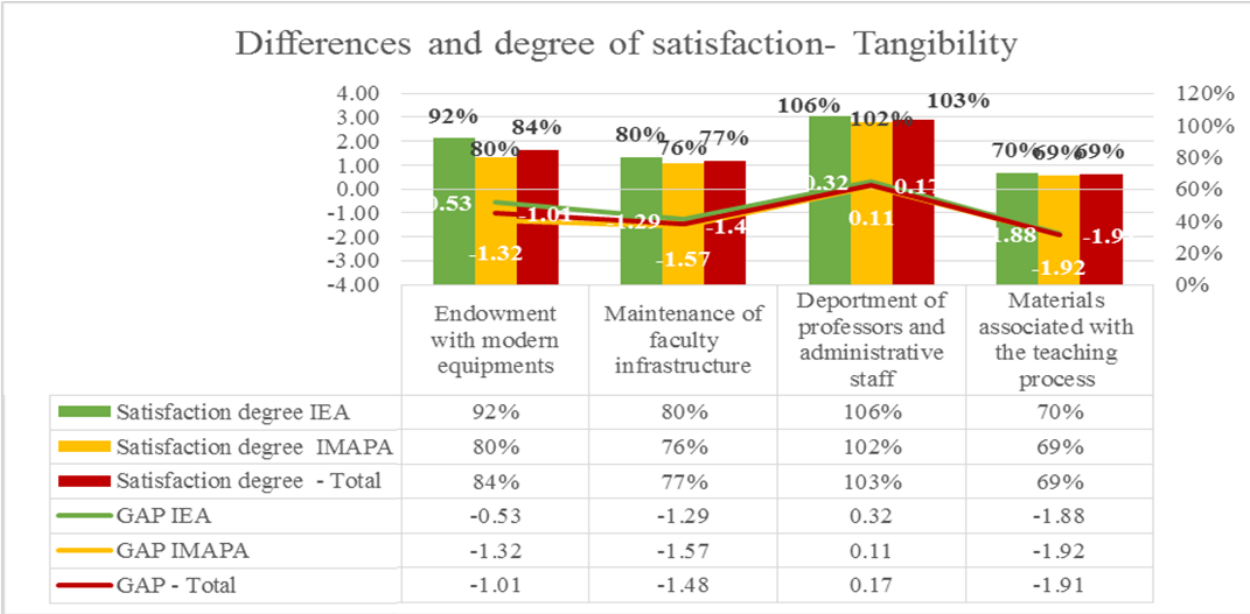


Fig. 3. Degree of satisfaction, GAP – Tangibility (IEA, IMAPA, Total)
Source: Own determination.

The students of IMAPA specialization have approximately equal expectations with those of IEA specialization, but less satisfaction for faculty endowments (GAP -1.32 / -0.53). The deportment of professors and administrative staff, the neat physical aspect is the only element that exceeds the expectations of both the IEA specialization and IMAPA. The materials related to the didactic process – courses / practical workbooks / books / library represent the aspect obviously less appreciated by both specialties (69%) - Fig. 3.

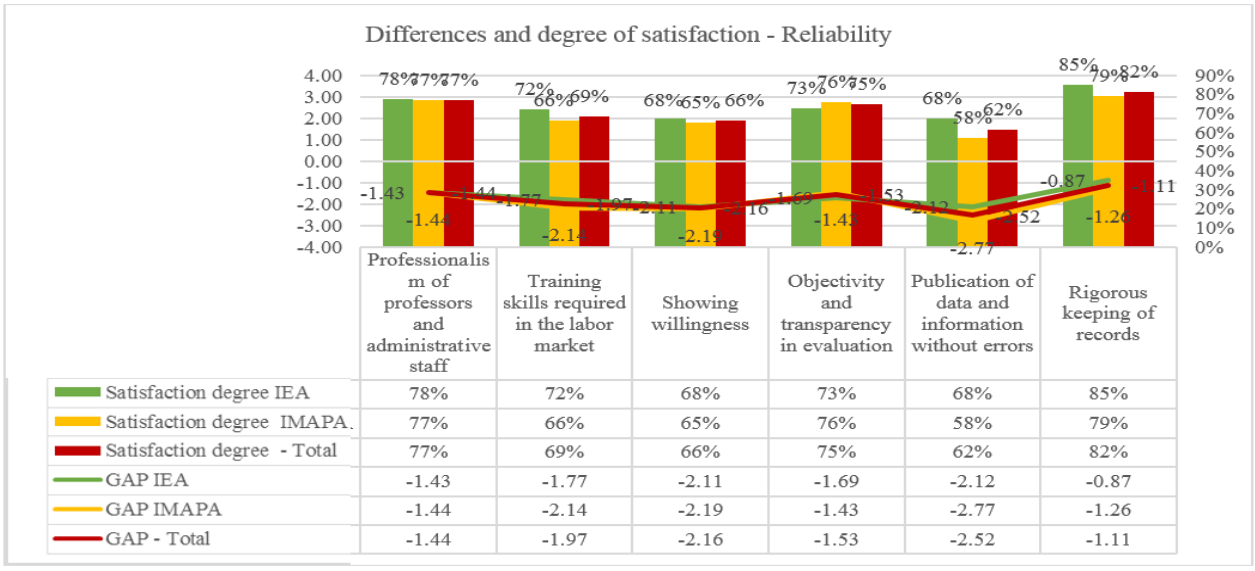
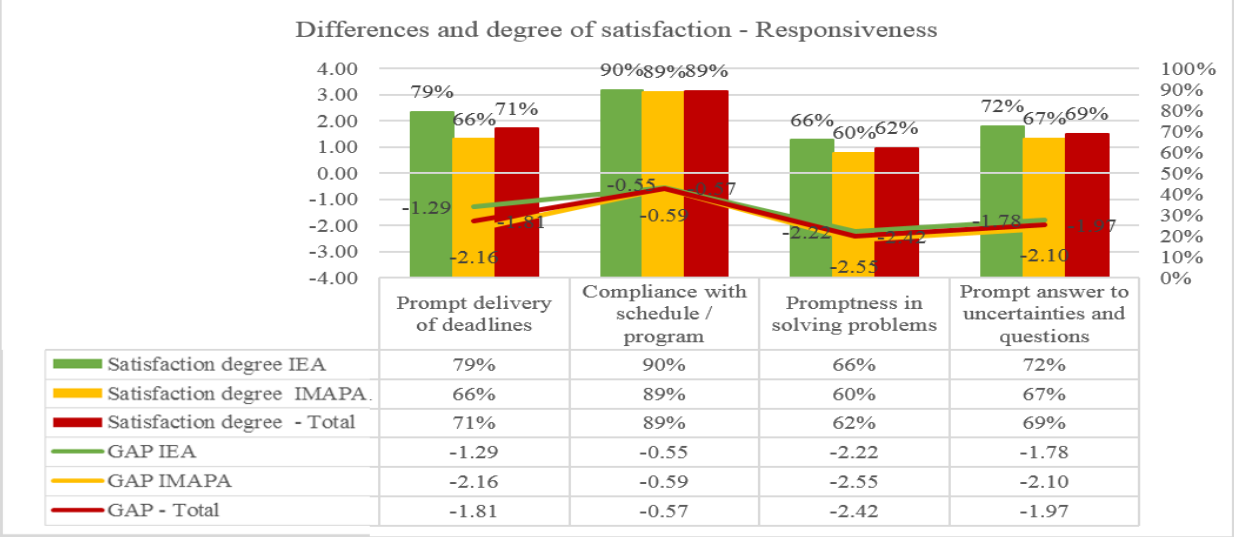


Fig. 4. Degree of satisfaction, GAP – Reliability (IEA, IMAPA, Total)
Source: Own determination.

From the analysis of the coefficients of variation results that the perceptions of the service quality are very different. These coefficients of variation are specific to relatively heterogeneous populations (coefficient between 0.2 and 0.3).

The greatest dissatisfactions come from the administrative and relational side. The respondents enrolled in IMAPA specialty report 42% unsatisfied, and those from IEA 32% when referring to the publication of error-free data and information. This situation

can be determined by the high volume of work in secretariat. It can be noticed that students enrolled in IMAPA are numerically more and more dissatisfied (Fig.4.).
The professionalism of the teaching staff and the administrative staff, the rigorous keeping of the records (applications for entries, presence) and the objective evaluation have had good perceptions.
Within the responsiveness dimension, it can be seen that IMAPA specialization is characterized by heterogeneity in the appreciation of perceptions - the coefficient of variation exceeds the value of 0.3 or 30%.



	Prompt delivery of deadlines	Compliance with schedule / program	Promptness in solving problems	Prompt answer to uncertainties and questions
Satisfaction degree IEA	79%	90%	66%	72%
Satisfaction degree IMAPA	66%	89%	60%	67%
Satisfaction degree - Total	71%	89%	62%	69%
GAP IEA	-1.29	-0.55	-2.22	-1.78
GAP IMAPA	-2.16	-0.59	-2.55	-2.10
GAP - Total	-1.81	-0.57	-2.42	-1.97

Fig. 5. Degree of satisfaction, GAP – Responsiveness (IEA, IMAPA, Total)
Source: Own determination.

Responsiveness seems to be a sensitive aspect of quality in our faculty. Expectations are high (6.12) and much less satisfaction (4.43 average value) on all components of this dimension. In IEA specialization, the expectations have an average value of 6.16 while the perceptions have a value of 4.70. In IMAPA specialization, the expectations are roughly equal - 6.10, but the value of perceptions is considerably lower - 4.25 (Fig.5.).
The students of IMAPA specialization are much less satisfied (Gap-2.16 / -1.29) than those of the IEA specialization regarding the communication of terms in didactic activity (handing over papers, exam dates, etc.) and the secretariat (submission of documents, enrollment in optional courses).
The students of both specialties would like a quicker solving of the problems occurred (Satisfaction degree - 62%). All students would like to be answered more promptly to queries and questions (Satisfaction degree - 69%).
IMAPA students are clearly less satisfied than those from IEA.
The students consider well-trained teachers (Degree of satisfaction - 90%) and are pleased with the teaching / learning methods (Degree of satisfaction - 80%), which they consider to be modern and adequate to learn easily.
The least satisfied declare with the possibility of finding a job after graduation. IEA students are more confident (Degree of satisfaction - 67%), while IMAPA students consider that they have fewer chances (Degree of satisfaction - 54%) - Fig. 6.
Both the respondents from the IEA (GAP - 1.46), but especially those from IMAPA (GAP -1.78) believe that the faculty should do more to provide the best training in the field (educational plan, disciplines, etc.)

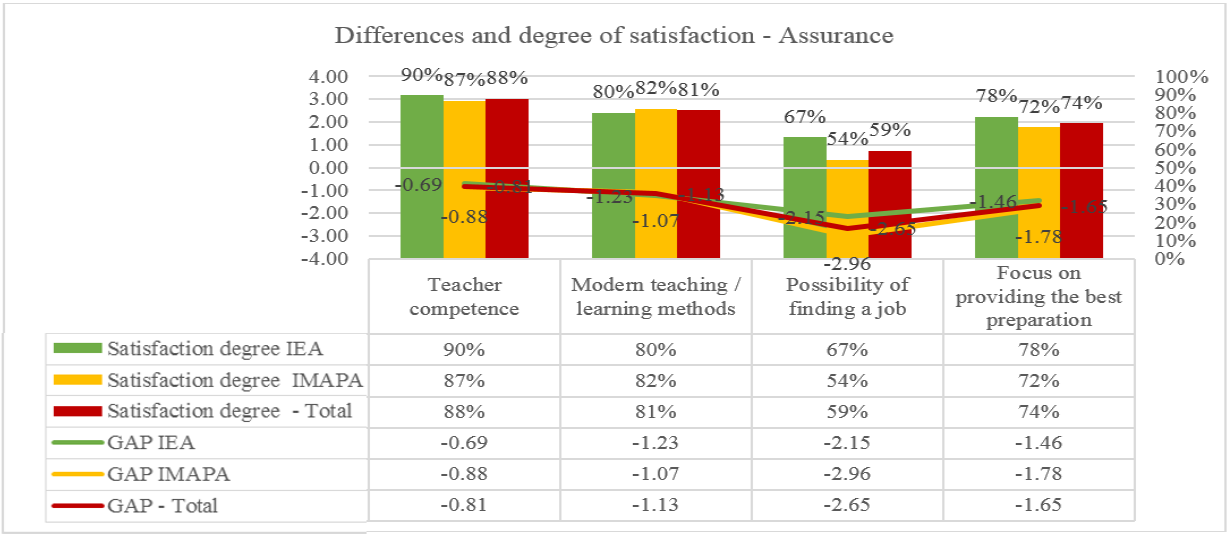


Fig. 6. Degree of satisfaction, GAP – Assurance (IEA, IMAPA, Total)
Source: Own determination.

For the aspects referring to **empathy**, students have very high expectations (6.14 / 7) and they consider to be medium satisfied with the way they relate to the teaching staff and the administrative staff (4.48 / 7). They consider that they are treated with politeness (Degree of satisfaction - 78%) and that most benefit of an individual approach to their problems and needs (Degree of satisfaction - 79%); The timetable for the courses, the rework program and the Secretariat's work program could be improved (Gap -2.04); Students would like a better feedback on the change and improvement proposals they make (Gap - 2.07) (Fig.7).

Students of IMAPA specialization are less satisfied than those of IEA specialization for all aspects.

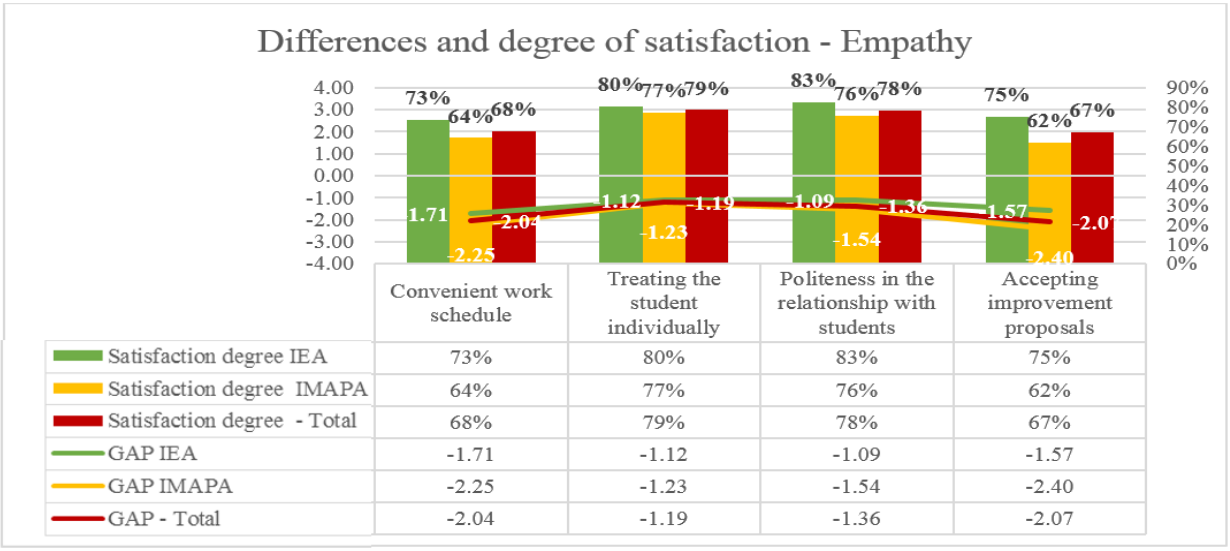


Fig. 7. Degree of satisfaction, GAP – Empathy (IEA, IMAPA, Total)
Source: Own determination.

Therefore, for the 5 dimensions of quality, the differences and the degree of satisfaction as weighted averages with the relative importance determined from survey based on questionnaire were recalculated in Table 3.

Table 3. Degree of satisfaction and GAP weighted with the relative importance of dimensions

Synthesis of degree of satisfaction IEA vs. IMAPA											
IEA						IMAPA					
No.	Dimension	i %	GAP	GAP p	Gs	Nr. crt.	Dimension	i %	GAP	GAP p.	Gs
1	Reliability	20%	-1.67	-0.34	74%	1	Reliability	20%	-1.87	-0.38	70%
2	Assurance	21%	-1.38	-0.29	79%	2	Responsiveness	19%	-1.85	-0.35	70%
3	Empathy	19%	-1.37	-0.26	78%	3	Assurance	20%	-1.67	-0.34	74%
4	Responsiveness	18%	-1.46	-0.26	77%	4	Empathy	17%	-1.85	-0.32	70%
5	Tangibility	22%	-0.84	-0.19	87%	5	Tangibility	23%	-1.17	-0.28	82%
Educational service		100%	-1.35	-1.33	79%	Educational service		100%	-1.68	-1.66	74%

i % = importance of each dimension set by respondents in questionnaire
GAP p =GAP weighted with the importance of each dimension.
Gs = Degree of satisfaction
Source: Own determination.

Establishing improvement measures

Following the study we were able to identify the improvement measures for each specialization. We considered that those with a satisfaction level of less than 75% require immediate corrective actions, because the reserve of improvement consists in the aspects with even more than 25% „lack of satisfaction" or „dissatisfaction".

It can be observed for the specialization Economic Engineering in Agriculture in Table 3 that the first 10 aspects meet the satisfaction threshold of less than 75%.

It can be noticed that the main improvements have to be done mainly in the administrative component, but also in the relation student – professor and administrative staff. Students are most dissatisfied with the fact that the problems that have arisen are not solved promptly (dissatisfaction - 34%), they are not sure that they could find a post-graduate job (dissatisfaction - 33%), that the data and information published on the site and on the notice board are published with errors and that the administrative staff and teachers do not show willingness in relation with them (dissatisfaction - 32%).

Table 4. Hierarchy of improvement measures - IEA

No.	Aspect	Medium GAP	Gs
1	Promptness in solving problems	-2.22	66%
2	Possibility of finding a job	-2.15	67%
3	Publication of data and information without errors	-2.12	68%
4	Showing willingness	-2.11	68%
5	Materials associated with the teaching process	-1.88	70%
6	Prompt answer to uncertainties and questions	-1.78	72%
7	Training skills required in the labor market	-1.77	72%
8	Convenient work schedule	-1.71	73%
9	Objectivity and transparency in evaluation	-1.69	73%
10	Accepting improvement proposals	-1.57	75%
11	Focus on providing the best preparation	-1.46	78%
12	Professionalism of professors and administrative staff	-1.43	78%
13	Prompt delivery of deadlines	-1.29	79%
14	Maintenance of faculty infrastructure	-1.29	80%
15	Modern teaching / learning methods	-1.23	80%
16	Treating the student individually	-1.12	80%
17	Politeness in the relationship with students	-1.09	83%
18	Rigorous keeping of records	-0.87	85%
19	Teacher competence	-0.69	90%
20	Compliance with schedule / program	-0.55	90%
21	Endowment with modern equipment	-0.53	92%
22	Deportment of professors and administrative staff	0.32	106%

Source Own determination.

The measures to mitigate dissatisfaction degree for these statements are simple and do not involve the allocation of excessively large additional resources. Improving the relationship with students would solve many of the issues that have arisen, and establishing practice protocols with Agribusiness firms for practice could increase the confidence they have in finding a job.

The hierarchy of improvement measures for IMAPA specialization showed that the lowest (54%) and highest dissatisfaction (46%) are at the point of finding a post-graduate job. Another aspect of high dissatisfaction is the fact that the data and information published on the site and in the notice board have errors. The third aspect in the order of dissatisfaction is the promptness in solving the problems - degree of dissatisfaction 40% (Table 4 and 5).

Table 5. Hierarchy of improvement measures - IMAPA

No.	Aspect	Medium GAP	Gs
1	Possibility of finding a job	-2,96	54%
2	Publication of data and information without errors	-2,77	58%
3	Promptness in solving problems	-2,55	60%
4	Accepting improvement proposals	-2,40	62%
5	Convenient work schedule	-2,25	64%
6	Showing willingness	-2,19	65%
7	Prompt delivery of deadlines	-2,16	66%
8	Training skills required in the labor market	-2,14	66%
9	Prompt answer to uncertainties and questions	-2,10	67%
10	Materials associated with the teaching process	-1,92	69%
11	Focus on providing the best preparation	-1,78	72%
12	Maintenance of faculty infrastructure	-1,57	76%
13	Politeness in the relationship with students	-1,54	76%
14	Professionalism of professors and administrative staff	-1,44	77%
15	Objectivity and transparency in evaluation	-1,43	76%
16	Endowment with modern equipment	-1,32	80%
17	Rigorous keeping of records	-1,26	79%
18	Treating the student individually	-1,23	77%
19	Modern teaching / learning methods	-1,07	82%
20	Teacher competence	-0,88	87%
21	Compliance with schedule / program	-0,59	89%
22	Deportment of professors and administrative staff	0,11	102%

Source Own determination.

CONCLUSIONS

In conclusion, both specializations have the same model of quality, which deviates somewhat from SERVQUAL model.

Expectations are relatively uniform (medium variation) - the population is relatively homogeneous, and the satisfaction perceived differently (great variation) - relatively heterogeneous, to heterogeneous population.

Compared to similar studies, the expectations of the students of the faculty regarding the quality in education are among the highest (6.24 / 7), with no major differences between the two specializations;

The medium quality perceived is over the medium level (4.69/7);

The educational service offered by our faculty provides a medium satisfaction level of 76%;

The students enrolled in IMAPA specialization have a lower level of satisfaction (are less satisfied) in each of the 5 quality dimensions and have a medium satisfaction level of 74%, compared to those from IEA specialization who have the medium degree of satisfaction of 79%. Both specializations require improvement measures, but priority is IMAPA;

Improvement measures should be treated differently for each study program;

The study allowed the identification of reserves to improve the quality for each study program (IMAPA and IEA).

Measures to mitigate dissatisfaction degree for these statements are simple and do not involve the allocation of excessively large additional resources. Improving the relationship with students would solve many of the issues that have arisen, and establishing protocols of practice with tourism, agro-tourism and public catering companies could increase the confidence they have in finding a job.

In conclusion, IMAPA specialization students are more dissatisfied than those of IEA. The hierarchy of improvement measures shows that the vulnerabilities are the same for both specializations, the measures that should be taken are generally the same, but the solutions should be addressed starting with IMAPA specialization.

REFERENCES

[1]Abdullah, F., 2006, Measuring service quality in higher education: HEdPERF versus SERVPERF. Marketing Intelligence & Planning, 24(1), 31-47.

[2]Cronin Jr, J. J., Taylor, S. A., 1992, Measuring service quality: a reexamination and extension. The Journal of Marketing, 56(3), 55-68.

[3]Cronin Jr, J. J., Taylor, S. A., 1994, SERVPERF versus SERVQUAL: reconciling performance-based and perceptions-minus-expectations measurement of service quality. The Journal of Marketing, 58(1), 125-131.

[4]DeShields Jr, O. W., Kara, A., Kaynak, E., 2005, Determinants of business student satisfaction and retention in higher education: applying Herzberg's two-factor theory. International Journal of Educational Management, 19(2), 128-139.

[5]Hemsley-Brown, J., Oplatka, I., 2006, Universities in a competitive global marketplace: A systematic review of the literature on higher education marketing. International Journal of Public Sector Management, 19(4), 316-338.

[6]Oldfield, B.M., Baron, S.,2000, Student Perceptions of Service Quality in a UK University Business and Management Faculty. Quality Assurance in Education: An International Perspective, 8, 85-95.

[7]Palmer, A., 2011, Principles of services marketing. 6th ed. Maidenhead: McGraw-Hill Education.

[8]Parasuraman, A., Berry, L. L., Zeithaml, V. A., 1991, Refinement and Reassessment of the SERVQUAL Scale. Journal of Retailing, 67(4), 420-450.

[9]Parasuraman, A., Zeithaml, V. A., Berry, L. L., 1985, A conceptual model of service quality and its implications for future research. The Journal of Marketing, 49(1), 41-50.

[10]Parasuraman, A., Zeithaml, V. A., Berry, L. L., 1988), SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality. Journal of Retailing, 64(1), 12-40.

[11]Parasuraman, A., Zeithaml, V. A., Berry, L. L., 1994. Reassessment of expectations as a comparison standard in measuring service quality: implications for further research. The Journal of Marketing, 58(1), 111-124.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE DESCRIPTION OF THE MODEL OF A GAMIFICATION-BASED ENVIRONMENT FOR BUSINESS SIMULATION USING THE UNIFIED MODEL LANGUAGE (UML) METHODS

Victor TIȚA, Daniel NIJLOVEANU, Doru Anastasiu POPESCU, Nicolae BOLD

University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania; University of Pitești, 1 Targul din Vale St, Pitești, Romania; Phone: +40(21)3182564, Fax: +40(21)3182888, Mobile: +40767911444, Emails: victortita@yahoo.com, bold_nicolae@yahoo.com

Corresponding author: bold_nicolae@yahoo.com

Abstract

The educational system in Romania in general and, particularly, the university environment has a large potential for developing new learning methods and techniques, especially in the area of simulated disciplines. One of the most useful skills that can be gained using specific tech-based environments is the establishment of an enterprise or, in short, the entrepreneurship, because it is part of the essential skills considered to be primary, according to the national education competences framework. The existing literature is concise regarding the development of methods of modelling business structures and processes, but the immersion in the education is standing at its early stages, related to the relatively low number of novel implementations in education and the potential. If in previous papers we have studied the structure of the intra- and inter-business relationships using system dynamics, this paper is intended to describe a future direction of development based on the study of business processes and their dynamic within the enterprise using specific tools described in the literature, as Unified Model Language (UML) and Business Process Model (BPM) for developing the theoretical model. The result of the study is intended to materialize in a piece of software that will be projected using software engineering based on UML methods and built on the principles of gamification in education. The software will serve as a virtual simulation environment which leads to the understanding of the principles of conducting a business for the formal part of university education.

Key words*: *Unified Model Language (UML), simulated snterprise, business process modeling

INTRODUCTION

Business simulation has significant roots in the need of optimization, of the rational usage of the limited resources [3]. Thus, in the domain, the resources can be classified in three major classes: those related to material needs (materials needed in production, financial assets etc.), those referring to human capacity (human resources) and those reported to time (flows and processes).

The preparation of students for entering in an economy-based workfield must contain the acquisition of these kind of concepts, regardless the domain in which they will work [4]. This is the role of business simulation concepts in the real world.

The domain of business simulation has a huge potential of being modeled using traditional technology-based methods [5, 6]. The literature contains several directions of studying business processes that are projected especially for the field of production. These projections and models are useful for optimizing the activity within the enterprise.

The novelty brought with our approach is based on the domain of application, in education, and the particular structure of the enterprise used in the process of modelling. Thus, we will develop the model for educational purposes with a particular structure given by the departments that base the enterprise.

MATERIALS AND METHODS

In the process of modelling the business processes within an enterprise used in our approach, the most important part is the projection of structures using The Unified

Model Language (UML). It is widely used as a software engineering tool, in the process of planification of the software, but it has also applications in modelling, due to its relatively high capability to project various structures into meaningful models used further in practice.

Unified Model Language

UML relies greatly on the visual part of modelling, the final results of the modelling step of build and development of any application or project being diagrams. From a structural point of view, the language is used for two purposes with two kinds of result diagram classes:

-Structural diagrams, a class that contains diagrams that refer to the architecture of the studied process or entity; the diagram that are used more in practice are the class diagrams;

-Behavioral diagrams, a class that refers to the functional part of the studied process or entity; the most common diagrams are considered the use-case, the sequence and the activity diagrams.

The power of UML diagrams relies in the emphasis of the relations that form between various departments and the big picture that is offered for the entire enterprise.

Business Process Modeling Notation

Business Process Modeling Notation (BPMN) is a method that uses flow charts to model a business process. Due to its strongly visual characteristic, BPMN is used to visualize flows within a business process from the beginning to the final steps.

BPMN depicts these four element types for business process diagrams:

-Flow objects: events, activities, gateways

-Connecting objects: sequence flow, message flow, association

-Swimlanes: pool or lane

-Artifacts: data object, group, annotation.

While UML relates more with the global image and structure of the enterprise, the BPMN approach is more process-oriented, visually representing the steps forming a process within a business.

Gamification

Due to its pervasive and versatile nature, gamification has a large research pool in the literature. Many researches in various domains apply gamification in models or implementations, because its adaptability and easiness in usage.

Structure of business

The departments of the simulated business are presented in the Figure 1.

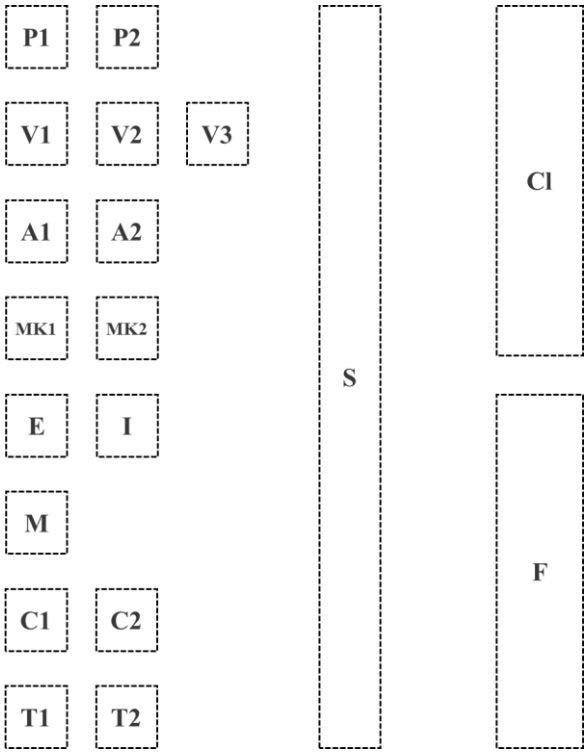


Fig. 1. Essential departments in the enterprise
Source: Original.

The departments are explained as follows:

-the P department refers to human resources: P1 relates to salary management and P2 to the actual HR department (training, development, work security etc.)

-the V department refers to orders: V1 relates to internal offers, V2 to internal orders and V3 to invoice management;

-the A department refers to acquisitions: A1 to relates to internal acquisitions and A2 to external acquisitions;

-the MK department refers to marketing: MK1 relates to marketing research and MK2 to promotions;

-the EI department refers to commerce: E relates to export and I to import;

-the M department refers to warehouse;

-the C department refers to accounting: C1 relates to financial accounting and C2 to management accounting;

-the T department refers to cash: T1 relates to cash register and T2 to bank relations.

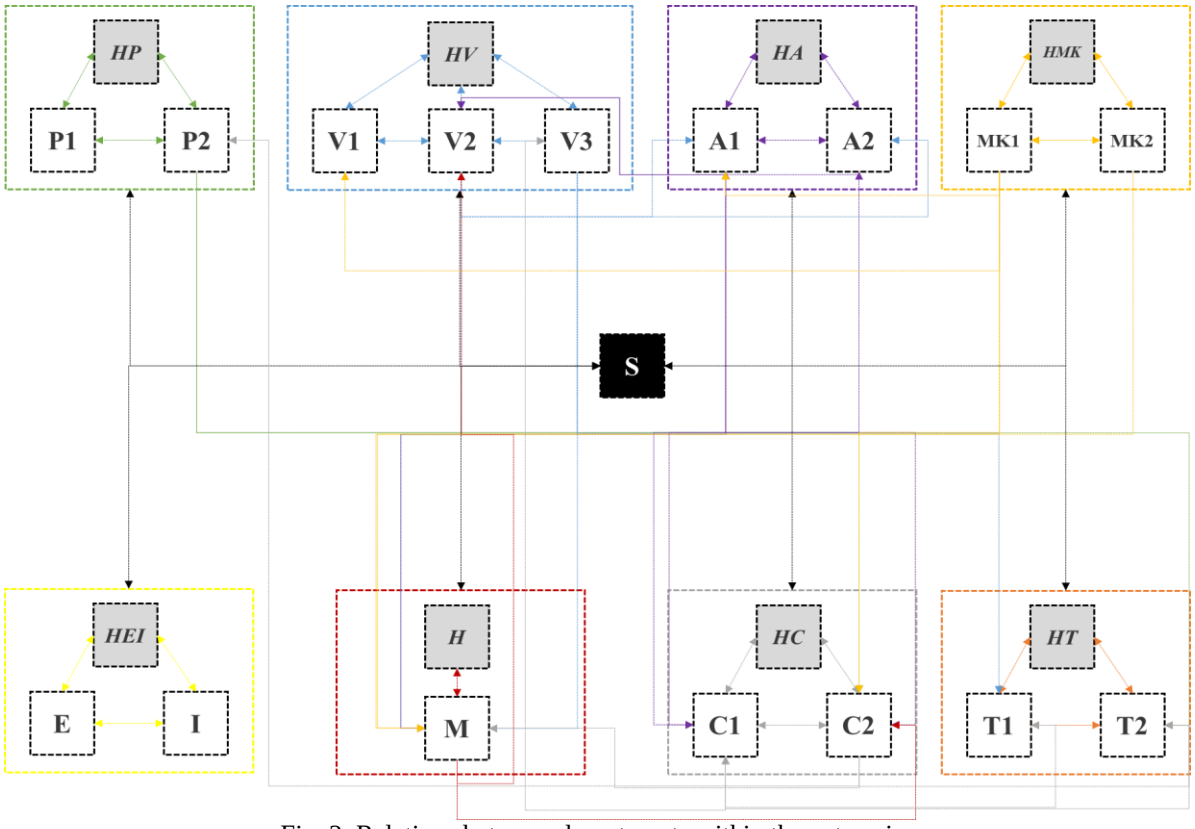


Fig. 2. Relations between departments within the enterprise
Source: Original.

As shown in Figure 2, every department is run by a head (H) which organizes the activity within the department and creates a link with the secretary department.

RESULTS AND DISCUSSIONS

In this paper we will present a class diagram, shown in Figure 3. The general structure of the class is formed of the documents generated by the class and the actions made by each of the department team or representative. The class diagram helps at creating a general image of the structure of the enterprise, enriched later with the relations between the departments and the flows created for a specific action. The class diagram can easily be completed with the other types of behavioral diagrams.

The essential departments described previously gather in the form of a basic enterprise [1], where the accent is put on the flow on the basic documents: HR documents, financial documents (payroll, invoices, bank statements, forecasts, sales reports, receipts) and marketing documents (promotional materials, orders etc.). The model will further follow the dynamic aspects related to the document flow and the product/service flow and the actions needed within the process [2].

The class diagram is useful especially for the case of studying the structural aspects of the enterprise. This diagram gives a clear picture of the building blocks of an economic entity and helps further in the process of completing the projection phase of the model of an enterprise.

In its usual form, the class diagram contains instances of the model classes. In our case, the classes are equivalent to the departments, the parameters are the main documents that link the activities between the departments and the methods are represented by the actions made within the departments by the employees. The links between the classes are made by the documents that circulate between the human resources that form the human capital of the enterprise.

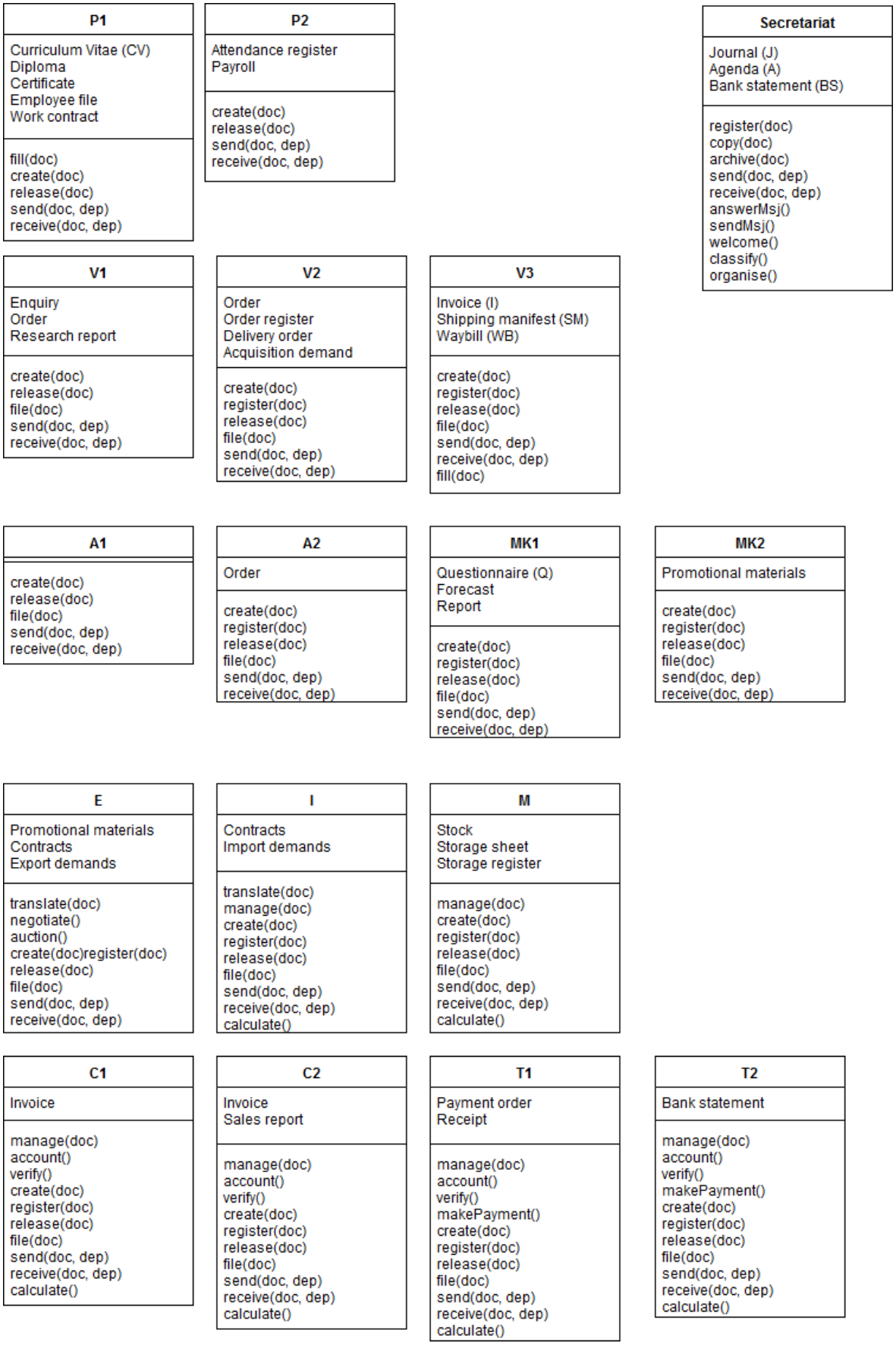


Fig. 3. Class diagram for the given structure
Source: Original

CONCLUSIONS

This paper is a starting point for a research, given the direction for a set of actions with the purpose of creating an environment which will be useful for forming a new enterprise culture within the students. The framework will also emulate a real-based structure based on the principles of gamification that will make the environment usable within the classes.

REFERENCES

[1]Barber, K.D., Dewhurst, F.W., Burns, R.L.D.H., Rogers, J.B.B, 2003, Business process modelling and simulation for manufacturing management: A practical way forward, Business Process Management Journal, Vol. 9(4):527-542.
[2]Fowler, A., 2003, Systems modelling, simulation, and the dynamics of strategy, Journal of Business Research, Volume 56(2):135-144.
[3]Giaglis, G.M., Paul, R.J., Hlupic, V., 1999, Simulation of Business Processes, Computational and Mathematical Organization Theory, *2*(4), 285-300.
[4]Gregoriades, A., Sutcliffe, A., 2008, A socio-technical approach to business process simulation, Decision Support Systems, Volume 45(4):1017-1030.
[5]Jahangirian, M., Eldabi, T., Naseer, A., Stergioulas, L.K., Young, T., 2010, Simulation in manufacturing and business: A review, European Journal of Operational Research, Volume 203 (1): 1-13.
[6]Lin, F.-R., Yang, M-C., Pai, Y.-H., 2002, A generic structure for business process modelling, Business Process Management Journal, Vol. 8(1):19-41.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

QUANTITATIVE AND QUALITATIVE SCREENING OF THE TRADITIONAL PLUM JAM FROM ROMANIA

Ioana TOMA[1], Mariana PIPIRIGEANU[2], Florentina Marin HADDAD[1], Cristina GARLEA[2]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Biotechnology, 59 Mărăşti, Boulevard, District 1, 011464, Bucharest, Romania, Phone: +40213182564, Fax:+40213182888, Mobile: 0766669752, Emails: oana.toma@madr.ro, haddad.florentina@ansvsa.ro
[2]CSCBA-INCE, Romanian Academy, Calea 13 September, District 5, Bucharest, Romania Emails: marianapipirigeanu@yahoo.com, cgarlea@yahoo.com

Corresponding author: oana.toma@madr.ro

Abstract

Traditional foods are a special category of products that, besides the intrinsic value of preserving and continuing regional and national customs in today's context, must meet consumer demands, particularly in terms of food safety and nutritional value. Increasing the production of this category of food under these conditions becomes a problem for producers, especially small ones. In this context we chose the case study for the identification of the main economic operators and of the fruit-growing areas in Romania, favoring the obtaining of raw materials with special qualities in order to process them. The production of plum jam, the process of obtaining jams traditional products, the quality of the final products and their main features have been analyzed in this research article. The conclusion was that processing and certification as a traditional "plum jam-magiun" product meets consumer safety and security requirements.

Key words**:** *processing, recording, traditional*

INTRODUCTION

Romania, before becoming an EU member country, has developed national legislation to protect those categories of agri-food products that have proven to be a tradition passed on from generation to generation. Thus, the first definition of the "traditional" product was given in a normative act adopted by the Ministry of Agriculture, Forests and Rural Development in Order no. 690/2004, which states in Article 4 that "the product must be manufactured from traditional raw materials, present a traditional composition or a production and / or processing mode reflecting a traditional type of production and / or processing.

The Ministry of Agriculture and Rural Development through the Strategy for Medium and Long-term Agri-Food Sector Development Horizon 2020-2030 aims at traditional, historical and sustainable valorisation of the agri-food potential and the development of rural space [1].

Traditional food products are a special category of products which, in addition to the intrinsic value given by preserving and continuing regional and national customs, in the current market context, must meet consumer requirements, particularly in terms of food safety and nutritional value [3]. Increasing production of this category of food under these conditions becomes a problem for producers, especially small ones. It can be solved only by knowing all the data in depth.

The main quality of traditional products, together with the subsistence of producers, is to capitalize on local raw materials.

Recipes, generally simple, based on some ingredients sometimes processed as simple, become quality products, appreciated by consumers [2].

Traditional products are food products manufactured in the country using local raw materials which do not contain food additives, which have a traditional recipe, a way of production and / or processing and a

traditional technological process and which differ from other similar products belonging to the same category [11].

Traditional Romanian products are products that use Romanian raw material, contributing to the economic development of rural areas, job creation, increasing the added value of Romanian products and their market value, consumer awareness of the quality of traditional products that are part of from the national culture, capitalizing on the local dowry. All these things support the increase of the Romanians' living standards [5].

There is good but still untapped potential for recognizing and promoting local brands by including them in EU quality systems (Table 1).

Table 1. The main systems in the field of agricultural and food quality

Traditional Specialty Guaranteed (TSG)	defines a traditional agricultural or food product whose specificity has been recognized by the European Community by its registration in the register. The name in order to be registered must express the specificity of the food or agricultural product. Traditional specialty guaranteed does not refer to an origin, but in order to obtain protection, the product must have a traditional composition (recipe) or a traditional way of production. The raw materials or the mode of production give the product the traditional character in relation to other products. To gain recognition, a product must be on the market for at least 30 years.
Protected Origin Designation (PDO)	may be the name of a region, a specific place, or a country used to describe an agricultural or food product. "The product must be: - originating in that region, specific place or country; - the quality or characteristics are due to the geographical environment with its natural and human factors, - the raw materials used must come only from the defined geographical area, - production, processing and preparation must take place only within the defined geographical area."
Protected Geographical Indication (PGI)	may be the name of a region, a specific place, or a country used to describe an agricultural or food product. The product must be: - originating in this region, specific place or country; - have a specific quality, reputation or other attributes attributable to geographical origin; - the raw materials used can also come from outside the defined geographical area; - certain operations of the production process such as packaging, freezing, storage, etc. may occur outside the defined geographical area.

Source: Regulation EP no. 1151/2012 [10].

Consumer choice of a traditional product is determined by the physiological or nutritional need, but also by other factors such as taste, income, availability, knowledge. The notion of food quality is complex due to the many factors that make it conditional: the quality of the raw materials and the used ingredients; the process of processing adopted; used equipment / production method; packaging; transport; storage conditions, etc.

In order to obtain plum jam, varieties of highly soluble dry substance, well-expressed flavors and pronounced coloring are used. Fruits must have a non-stained surface with a specific coloring, mature (because they have a high sugar content), free from diseases, insects, etc. Plums must have specific flavor and taste without showing traces of mold and fermentation [9]

MATERIALS AND METHODS

The purpose of this research is to achieve a quantitative and qualitative analysis of traditional products in Romania. For this purpose, literature and databases have been researched to collect information on raw materials used for the production of plum jam, the process of obtaining jams traditional products, the quality of the final products and the main features.

The main databases used were from the Ministry of Agriculture and Rural Development.

According to data centralized by the specialized department of the Ministry of Agriculture and Rural Development (MADR) based on order no. 690/2004, for the period of 9 years, 1,541 meat products have been certified as "traditional products", followed by milk products 1,535, bread and pastry products 750, drinks 285, fruits and vegetables (jams, jam) 193, and fish 11.

The tree species with the highest weight in the plantations structure in Romania are apple, plum, cherry and cherry.

Plum culture as a surface is concentrated in the following areas:

• development macroregion 4 consisting of counties: Dolj, Gorj, Mehedinti, Olt, Valcea, Arad, Caras Severin, Hunedoara, Timis;

• in the south of the country, in the counties: Arges, Calarasi, Dambovita, Giurgiu, Ialomita, Prahova, Teleorman.

Important plum areas are located in the counties: Arges, Valcea, Buzau, Prahova, Dambovita, Caras Severin, Gorj, Mehedinti, Olt and Vrancea. According to INS data, plum tree production increased from 372.6 thousand tons in 2005 to 477.8 thousand tons in 2017 [4].

In Fig. 1. It is represented schematically the total plum production in the main counties in Romania in 2015 in tons.

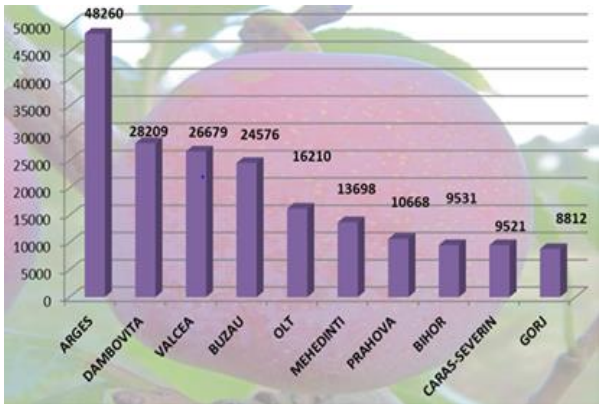


Fig. 1. Total production of the first counties cultivated with the plum species in 2015 in tons.
Source: Romanian Statistical Yearbook,2007-2013 [6]
Own determination.

The important areas cultivated with the plum species are located in the following counties: Arges, Valcea, Buzau, Prahova, Dambovita, Caras Severin, Gorj, Mehedinti, Olt and Vrancea. The evaluation of the agricultural areas related to the plum crops was considered useful (Fig. 2).

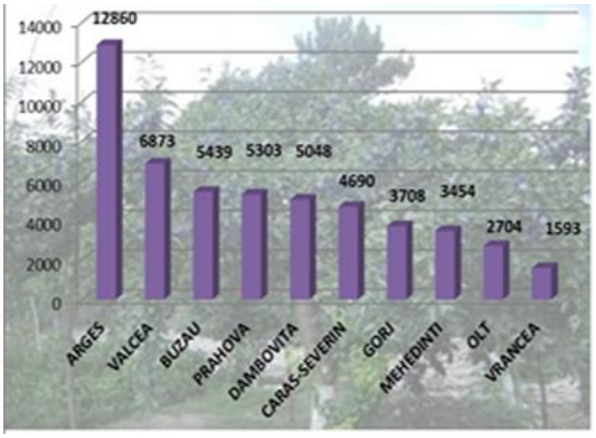


Fig. 2. The surface of the first counties cultivated with plum species in 2015, hectares.
Source: Romanian Statistical Yearbook, 2015 [7].

RESULTS AND DISCUSSIONS

In Romania there are 72 economic operators that deal with the processing of vegetables and fruits. According to statistical data from the National Registry of Traditional Products (RNPT), there are 9 producers certified in the production of "plum jam-magiun" and 2 derivatives (dried plums), distributed in the country according to the chart in Fig. 3 below.

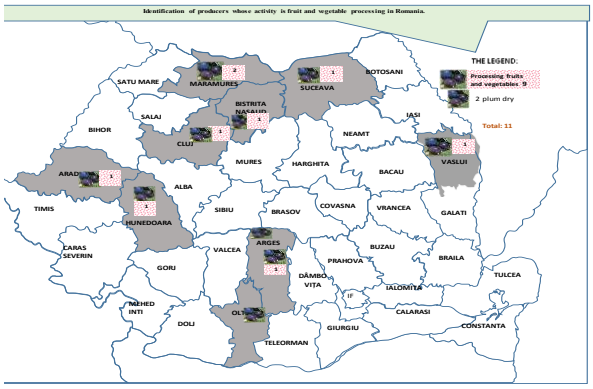


Fig. 3. Identification of producers whose activity is fruit and vegetable processing in Romania
Source: Own determination.

Between 2014 and 2016 were analyzed the products from 72 economic operators.

Of the products manufactured by these economic operators, following the screening, 9 traditional "plum jam-magiun" products were identified, certified by the Ministry of Agriculture and Rural Development between 2014 and 2016. In Table 2 are presented the traditional "plum jam-magiun" products, certified at national level: their description, the process of obtaining and the main sensory characteristics.

Table 2. Organoleptic properties of "plum jam-magiun", registered as a traditional product

Organoleptic properties of "plum jam-magiun", registered as a traditional product			
appearance	color	taste and smell	consistency
Magiun area of Arad County Obtaining: by boiling in copper boilers, without the addition of sugar or other ingredients			
consistent, homogeneous paste (without stones, burns and impurities, visible cuts or foreign bodies)	color specific to the Bistritan, Rosu, Bumbuleu, Neguț and Crandan varieties	sweet, sweet and sour with a well-pronounced taste and aroma	A uniform, paste-like meal that stretches easily without the syrup
Magiun area of Arges County Obtained: from plums of the Anaspet and Stanlley varieties rich in carbohydrates and vitamin C, without added sugar.			
homogeneous paste throughout the product without clumps or peel, glossy on the surface due to the local method	the color of the product is dark brown due to prunes at the maturity of the baking, being influenced by the long cooking time	the taste is sweet and aromatic sweet given by well-ripened plums with a specific flavor	the product does not show any foreign smell of burn, fermentation or mold
Magiun area of Bistrita Nasaud County Obtained: of bistrita plums whose core is carnose, aromatic and sweet by boiling in brass boilers, without being chopped and without the addition of sugar.			
homogeneous, viscous mass without impurities,	dark brown to light brown strong	loud	strong flavor characteristic of Bistritan plums
Magiun area of Cluj County Obtained: Raw plums without added sugar			
homogeneous table, with completely disintegrated fruits, of which no syrup is separated, no signs of fermentation or molding, no foreign bodies	brown, corresponding to the fruit (plum), uniform throughout the table	taste and pleasant flavor, specific to plum, sweet, slightly sour, without taste and foreign smell	viscose
Magiun area of Hunedoara County Obtained from the Houneson plums, scrubbing, pistachio removal by poultry and boiling			
homogeneous mass,	color,brown, uniform	tasteful characteristic	characteristic smell
Magiun area of Maramures County obtained from the plum of the Bistrita variety without sugar			
homogeneous, viscous mass without impurities and no signs of fermentation or mold stains	dark brown to dark brown, glossy, also influenced by boiling time	taste sweet, sour, pleasantly tasted ripe Bistritan with no foreign taste	a pleasant, strong flavor characteristic of Bistritan plums
Magiun area of Maramures County obtained from the plums freshly oiled bistro variety of the certified organic orchard, with a maximum content of sugars, organic acids, vitamins and minerals.			
homogeneous, viscous mass without impurities	dark brown to light brown strong	loud	strong flavor characteristic of Bistritan plums
Magiun area of Suceava County obtained from boiled plums until it dips after which it is sugar-free			
with a specific, homogeneous and well-bound texture	dark brown to light brown strong	sweet and sour	homogeneous and well-bound texture
Magiun area of Vaslui county Obtain a season: from plums "Romanian eggplants" (pears) from plums of Bistrita. Rich in vitamins C, A, B1, B2, K, fibers and minerals such as sodium, potassium, calcium and iron, but also organic acids, antide and cellulose. Spoons are boiled with bio sugar (1kg of sugar per 10kg of podvile)			
homogeneous aspect	burgundy color to black	taste predominantly sweet sardine and sweet smell of fresh fruit	dense consistency

Source: Own determination.

All traditionally certified products meet the parameters of the admissibility conditions for

organoleptic properties and the physico-chemical characteristics, soluble substance, in refractometric conditions, at 20 ° C (in syrup) min% 55.

Table 3. Physico-chemical characteristics of "plum jam-magiun", registered as a traditional product by county

Physico-chemical characteristics			
Product- Plum Jam (Magiun)	Acidity %	Humidity %	SU %
Magiun, area of Arad County	1.11	42.59	57.67
Magiun, area of Argeș County	1.75	50.10	55.43
Magiun, area of Bistrița Năsăud County	1.40	51.42	55.41
Magiun, area Cluj County	1.8	50.42	74.42
Magiun, area of Hunedoara County	1.10	48.7	56.37
Magiun, area of Maramureș County	1.31	51.00	55.41
Magiun, area of Maramureș County	1.36	50.20	55.45
Magiun, area of Suceava County	1.37	53.20	56
Magiun, area of Vaslui County	0.51	56.14	57

Source: Own determination.

The products were analyzed by physico-chemical and organoleptic methods by an accredited and authorized laboratory according to the national legislation in force.
Figure 4. shows the results of dry matter analyzes in traditional products [8].

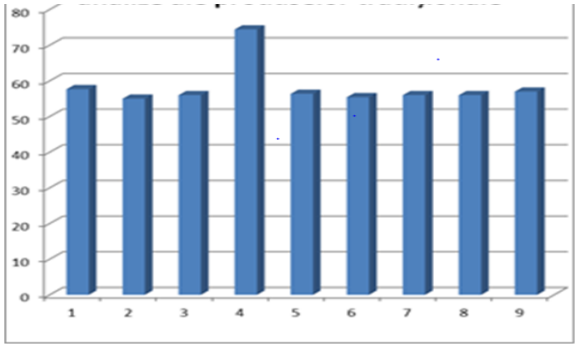


Fig. 4. Dry matter from traditional products- SU %.
Source: Own determination.

CONCLUSIONS

The valorification of Romania's agricultural potential leads to the revitalization of rural areas through the use of local raw materials, the creation of new jobs, the increase of value added and the market value of agri-food products, consumer awareness of the quality of traditional products belonging to the culture of the people Romanian, are defining elements for the development of national strategies and programs to ensure the implementation of policies to encourage traditional Romanian products.
The use of local dowry, the protection of natural resources and, last but not least, the raising of living standards in rural areas should be a permanent preoccupation of all actors involved in the agri-food sector and beyond.
Processing and certification as a traditional "plum jam-magiun" product meets consumer safety and security requirements.

REFERENCES

[1] Alexandri, C., Davidovici, I., Gavrilescu, D., 2004, Agricultural Economics Treaty, Expert Publishing House, pp. 1 – 96.
[2]Belc, N., 2016, Bio-Economics of Sustainable Processing and Consumption, "Romania educată" UEFISCDI, University of Timisoara, pp. 1-19.
[3]Dinu,V., 2018. Food Safety in the Context of the European Union. Amfiteatru Economic, 20(47), pp.5-7.
[4]Ministry of Agriculture and Rural Development, 2013, Order No. 724/2013 on the certification of traditional products, http://www.madr.ro/docs/ind-alimentara/produse-traditionale/ordin-privind-atestarea-produselor-tradiționale.pdf, Accessed on 2019.
[5] MADR, 2014,Ghid de bune practici pentru atestarea produselor traditionale, http://www.madr.ro/docs/ind-alimentara/produse-traditionale/ghid-de-bune-practici-atestare-produse-traditionale-18.02.2014.pdf, Accessed on 2019.
[6]National Institute of Statistics, Romanian Statistical Yearbooks 2007-2013, www.insse.ro, Accessed on 2018.
[7]National Institute of Statistics, Romanian Statistical Yearbook, 2015, www.insse.ro, Accessed on 2018.
[8]Order No.852 of 27.05.2014 to approve the Norm on the nature, content and manufacture of " plum jam " intended for human consumption.
[9]Order no. 852/623/216/2014 of the Ministry of Agriculture and Rural Development, of the Ministry of Health and of the National Authority for Consumers Protection for the approval of the Norm regarding the nature, content and manufacture of "plum jam-magiun" intended for human consumption (Ordin nr.852/623/216 din 2014 al Viceprim-ministrului, Ministrului agriculturii şi dezvoltării rurale, al Ministrului sănătăţii şi al preşedintelui Autorităţii Naţionale pentru Protecţia Consumatorilor pentru aprobarea Normei cu privire la natura, conţinutul şi

fabricarea magiunului de prune destinat consumului uman),http://www.cdep.ro/pls/legis/legis_pck.htp_act?ida=124379, Accessed on 2019
[10]Regulation (EU) No. 1151/2012 of the European Parliament and of the Council of 21 November 2012 on quality schemes for agricultural products and foodstuffs,https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32012R1151, Accessed on 2019
[11]Zamfir, C., 2014, Determinants of Quality of Life, Romanian Sociology, 13(1), pp. 5-28.

Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 19, Issue 2, 2019
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE IMPACT OF FINANCIAL MANAGEMENT PERFORMANCE ON THE SUSTAINABLE DEVELOPMENT OF AGRICULTURAL ENTERPRISES IN THE REPUBLIC OF MOLDOVA

Dmitrii TRACI, Aurelia LITVIN, Anatol RACUL

State Agrarian University of Moldova, 44 Mircesti Str., 2049, Chisinau, Republic of Moldova, Emails: dtrach.72@mail.ru, a.litvin@uasm.md, anatol.racul@gmail.com

Corresponding author: anatol.racul@gmail.com

Abstract

This paper aimed to present an assessing method of the impact of financial management performance in the agricultural enterprises of the Republic of Moldova by using the nonparametric modelling of economic efficiency. Data Envelopment Analysis it was defined as the rating of the economic efficiency determined on the basis of financial indicators of the performance management. Assessed functional relations are based on the econometric criteria of precision evaluation and are classified according to the types of agricultural activities defined by the National Bureau of Statistics. The typology of agricultural enterprises is established by clustering techniques based on the Euclidean metric.

Key words**:** *agricultural enterprises, data envelopment analysis, econometric models, typology*

INTRODUCTION

The Republic of Moldova is an ex-Soviet county located in eastern Europe and can be evaluated as a transitional economy since its declaration of independence in 1991. Since independency the country introduced a marked economy and in this way the prices and financial interest rates are liberalized and thus the preferential credits to state enterprises has been removed. After the economic crisis and energy shortages the economy began to change and has shown steady annual growth of between 7% and14%. The rate of overall unemployment was reduced to 5% in 2015 and agricultural production to the relative weight of the service sector in the economy of Moldova began to dominate GDP [5].

Agriculture is the main direction of development in the Moldovan economy employing 50% of the labor force and give 60% of GDP, provide two-third of the country export (mainly food, alcohol, and tobacco, production). The share of population that lives in the rural areas now is representing 65% and dominate on the human resource market in the country. Different type of the agricultural outputs includes winter wheat, tobacco, sun flower, grapes, corn, fruits, vegetables and a large variety of animal products. It is possible to obtain because the country have very fertile soils and enough chip human resources. Evidently the Republic of Moldova have main comparative advantage in developing agricultural sector by using rich naturals resources, workforces with the highly cultured population. There are many obstructions in performing and registering the agricultural enterprises because of the too costly, useless time spending and very bureaucratic office work.

Regarding to the necessity to ensure a sustainable development of the agrifood sector by using the accounting techniques and financial methods it is necessary to define the theoretical part of the field and the authentication of the economic practices in the activity of agricultural enterprises. That is why the developing of the agrarian business, which requires an increasingly market competitive environment, assumes that the managerial decision-making process is based on the precise, pertinent and complete information regarding the economical and financial performances of the agricultural enterprise during the past and the present management leadership of the periods by establishing the future economic and financial

development strategy on production growth, increasing profit, ensuring financial balance, liquidity flow, profitability at the minimum level of risk [3].

In the agricultural sectors of the Republic of Moldova financial analysis is a very useful instrument for the scientific substantiation of the decisions that the business leaders in the area have at their disposal. In order to define the past, present and future of economic and financial performance of the agricultural enterprise, the technics based on financial analysis starts with the necessity to specify the object and the field of activity in agrifood sector and to consider the technical, human, financial and commercial potential characterizing its activity in terms of financial needs, profitability and risk. As a result of the processing of financial data, we have the possibility to ensure an equilibrium in the medium and long-term agricultural activity of the enterprise. For this purpose, it is necessary to evaluate the possibilities of realizing the cash accumulations and increasing the profitability of the enterprise. A very important component in the evaluation of company's growth resources is to defined the ways to maintain the financial independence of the economic entity in agricultural sector by identifying the capacity of the enterprise's financial and patrimonial potential, the sufficiency of financial resources and liquidity, the quality of the asset portfolio of cost-effective assets of the enterprise in rural area and its reliability in the market business environment [4].

The SWOT analysis identifies the weaknesses of the enterprise's financial assets by highlighting the insufficient financial resources, reduced self-financing capacity, fragility of the financial structure, fragility of the financial balance, low liquidity of assets, fragility of production profitability and capital indebtedness. An important link in optimizing the activity of the economic agent in agriculture is to highlight the risks that may lead to destabilization of the business sustainability of the enterprise or even lead to bankruptcy and guarantee the business relations of the enterprise with its own partners that are suppliers, customers, banks, holders of financial securities, public authorities interested in jointly doing business safely, without the risk of financial malfunctions and imbalances, insolvency.

Financial management approach in the Republic of Moldova is designed to evaluate the assessment of enterprises to be restructured in the agricultural sector and those that have to be merged or liquidated and that involves the support of shareholders as owners in making the most appropriate optimal decisions.

MATERIALS AND METHODS

The performance of an economy, its efficiency and the efficiency of production factors represent the key elements of the financial analysis. Over the past two decades, specific methods for assessing financial management performance have been developed and most of them could be applied at microeconomic level. These methods can also be successfully implemented at the national economy level in order to assess the financial management performance for the improving of the agricultural policy in the Republic of Moldova.

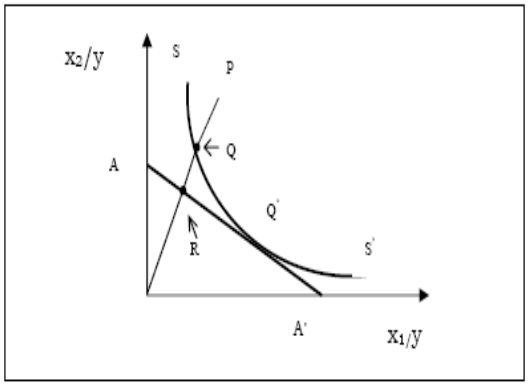


Fig. 1. Evaluation of financial management performance according to the indicators of technical efficiency and allocative efficiency
Source: [8].

According to Farrell, a firm's financial management performance consists of two components: technical efficiency (TE) that reflects a firm's ability to obtain the maximum output from a given set of inputs and allocative efficiency that reflects firm's

ability to use optimal proportion of inputs, setting the respective prices and production technology. These two criteria of a firm's financial performance are properly combined in order to ensure the measure of the total economic efficiency [6].

Figure 1 shows the performance evaluation for the firm that are using two inputs (*x1, x2*) to produce a single output (*y)* in the hypothesis of constant returns to scale. It is also supposed that we know the isoquant of the fully efficient firms that is equivalent to the related production function.

The evaluation technique of the financial performance indicator requires VRS (Variable Return to Scale) option and the results obtained are presented in Table 1. The primary data by mathematical processing with formula 1 are presented in the information on the financial situation of 742 agricultural enterprises in the Republic of Moldova (according to CAEM code of the National Bureau of Statistics - NBS). According to Table 1, TE assessment (financial management performance) depends on the values of the Y-factor and the inputs presented by the exogenous factors X1..X5.

The system of financial indicators used for the assessment of financial management performance in the agricultural sector of the Republic of Moldova is represented by:

1. Rate of financial return

$$Y = \frac{\text{net income}}{\text{own capital}}$$

2. Commercial profitability ratio

$$X1 = \frac{\text{net income}}{\text{sales revenue}}$$

3. Overall liquidity ratio

$$X2 = \frac{\text{circulating assets}}{\text{current liabilities}}$$

4. Total indebtedness degree (leverage effect)

$$X3 = \frac{\text{current debts} + \text{long term debts}}{\text{proper capital}}$$

5. Financial autonomy ratio

$$X4 = \frac{\text{proper capital}}{\text{proper capital} + \text{long term liabilities}}$$

6. Increase in sales

$$X5 = \frac{\text{sales revenue 2016}}{\text{sales revenue 2015}}$$

7. Economic profitability ratio

$$X6 = \frac{\text{gross income}}{\text{total assets}}$$

8. Partial liquidity ratio

$$X7 = \frac{\text{total circulating assets} - \text{materials} - \text{goods} - \text{production under manufacturing process}}{\text{total current liabilities}}$$

9. Total indebtedness ratio

$$X8 = \frac{\text{total current liabilities} + \text{total long term liabilities}}{\text{total liabilities}}$$

10. Increase in assets

$$X9 = \frac{\text{total assets 2016}}{\text{total assets 2015}}$$

Using the duality of linear programming, we can determine an equivalent envelopment form of this problem:

$$\begin{cases} \min\limits_{\theta,\lambda} \theta \\ -y_i + Y\lambda \geq 0 \\ \theta x_i - X\lambda \geq 0 \\ N_1\lambda \leq 1 \\ \lambda \geq 0 \end{cases} \quad (1)$$

where:

θ-represents financial performance parameter;

n -is the number of economic agents;

Y-represents the vector of outputs, n-dimensional, which is given by the financial profitability ratio of the agricultural enterprises;

X-represents the vector of inputs, n-dimensional, which is given by the financial indicators:

X1 - commercial profitability ratio;

X2-overall liquidity ratio;

X3-total indebtedness degree (leverage effect);

X4 - financial autonomy ratio;
X5 -increase in sales;
N1-is a n-dimensional vector with 1 component;
λ- represents the variables of the linear programming problem to be solved.
The value of technical efficiency $\theta \leq 1$, where a value equal to 1 represents a limit point on the frontier, i.e. a company with technically absolute performance.
The processing of primary data was carried out by using the software DEA_UASM developed within the State Agrarian University of Moldova.

Table 1. Evaluating technical efficiency of agricultural enterprises activating in the Republic of Moldova in the financial year 2016

Nr	Main agricultural activity CAEM	Employed staff	Financial profitability ratio	Commercial profitability ratio	Overall liquidity ratio	Total indebtedness degree	Financial autonomy ratio	Increase in sales	Technical efficiency
			Y	X1	X2	X3	X4	X5	TE
1	A0111	10	0.080	0.083	3.098	0.884	0.625	1.073	0.205
2	A0111	25	0.132	0.029	1.346	1.311	0.790	1.183	0.430
3	A0111	11	0.029	0.168	2.214	0.154	0.951	1.342	0.092
4	A0111	2	0.563	0.779	5.114	0.509	0.798	2.804	0.346
5	A0111	3	0.025	0.022	9.069	0.121	0.955	0.716	1.000
6	A0111	8	0.151	0.085	2.369	5.288	0.198	0.915	0.220
7	A0111	4	0.126	0.241	10.311	0.090	0.947	0.997	0.800
8	A0111	22	0.021	0.012	3.185	1.999	0.417	1.103	0.231
9	A0130	30	0.239	0.220	30.632	0.327	0.768	1.252	1.000
10	A0111	7	0.123	0.228	6.353	0.078	0.980	1.420	0.343
11	A0111	10	0.221	0.157	2.724	0.583	0.770	1.173	0.311
12	A0147	26	0.006	0.004	1.150	1.045	0.572	0.934	1.000
13	A0141	10	0.072	0.093	57.385	1.216	0.453	1.351	1.000
14	A0146	162	2.687	0.079	5.880	22.457	0.047	1.343	1.000
15	A0322	20	0.027	0.263	3.154	0.164	0.938	1.955	0.044
16	A0147	19	0.033	0.062	0.587	0.896	0.855	0.756	0.229
17	A0111	3	0.663	0.047	2.484	3.865	0.287	2.021	1.000
18	A0111	2	0.149	0.161	0.117	9.661	0.555	5.342	0.228
19	A0111	3	0.387	0.170	1.066	4.206	0.233	4.076	0.899
20	A0111	1	0.054	0.015	0.730	3.037	0.323	1.343	1.000
…									
The arithmetic average of financial management performance									0.5843

Source: Own calculations based on data of NBS.

RESULTS AND DISCUSSIONS

Financial management performance was evaluated according to CAEM codes applying the DEA data envelopment methodology for different sectors of Moldova's agriculture. In the Table 2 presents the comparative analysis of economic enterprises activating in different agricultural sectors indicating their financial management performance. For example, it is obvious that grape cultivation represents a high financial performance as this sector ensures a value added of the high production process. At the same time, the activities related to the sheep breeding and fish breeding sectors record low efficiency and require substantial capital investments in order to redress these areas of economic activity. According to Table 2, the comparative analysis of different sectors involved in obtaining agricultural production gives the possibility to optimize the agricultural policies of the decision makers in the field of financial investments [1].
The evaluation of financial management performance requires the identification of economic indicators that significantly influence the TE value determined by the nonparametric DEA method. The ratio method is based on the comparison between absolutely different values of the categories and items of the balance sheet or of the

balance sheet annexes that are closely related to each other and characterize the overall financial situation or financial situation per sectors. Therefore, the ratio method highlights significant aspects of the balance sheet, the results account and the cash flow statements. The profitability ratios are synthetic indicators, which assess in a relative form the profitability level or the ability of the enterprise to generate profit. The profitability ratio, as an indicator, may have several forms of expression, depending on the way the effect indicator or the results indicator is reported (income, liquidity or other partial indicators of profitability) to a global activity indicator (turnover, operating income, value added) or to the advanced or consumed economic means in order to obtain the respective result (as effort indicators). The most important profitability ratios are the following: economic profitability ratio, financial profitability ratio, profitability ratio of consumed resources and income profitability ratio [2].

Table 2. Evaluation of the financial management performance in different sectors of the agricultural activity of the Republic of Moldova

Nr.	CAEM	Classification of agricultural, forestry and fish breeding activities	TE
1	A 0111	Cultivation of cereals (excluding rice), leguminous and oleaginous plants	0.577
2	A 0113	Cultivation of vegetables and melons (water melons), plants with tuberous roots	0.625
3	A 0121	Grape cultivation	0.673
4	A 0124	Cultivation of stone and seeded fruits	0.607
5	A 0125	Cultivation of fruit bearing shrubs, strawberries, walnuts and other fruit trees	0.575
6	A 0141	Dairy cattle breeding	0.507
7	A 0145	Sheep and goat breeding	0.426
8	A 0146	Pig breeding	0.640
9	A 0147	Poultry breeding	0.610
10	A 02	Forestry and forest exploitation	0.661
11	A 03	Fish breeding and aquaculture	0.450

Source: Own calculations based on data of NBS.

The ratio of economic profitability measures the overall performance of a company, regardless of the way of financing and the tax system. This ratio can be expressed in several forms, depending on how the effort indicator is expressed. We can use:

- the return on assets, when the effort indicator is represented by the overall or operating assets;
- the return on invested capital, when the effort indicator is represented by the invested capital.

By dividing the net income to the sum between fixed assets and circulating assets, the return on assets is calculated. Using its value, the efficiency of asset allocation and usage performed by the company's is estimated. Furthermore, by dividing the net income (or total return of any investment) to the total amount of invested capital, the return on investment is calculated. This financial ratio is of particular interest to all investors (current or potential), as it is usually used as a benchmark when comparing it to the profitability of other placements, like bank deposits, bonds or even investments in other companies. Still, it is relevant also for managers, as a high value yields an efficient management of invested capital.

By comparing the weighted average cost of capital (WACC) with the chosen economic profitability ratio, there can be the following:

- when X6 > WACC, this means the obtained overall profitability is higher than the cost of capital, thus increasing the economic value of the enterprise;
- when X6 < WACC, this means the obtained overall profitability is lower than the cost of capital, thus decreasing the economic value of the enterprise.

The rate of financial return (Y) estimates the efficiency of capital allocation. Considering this, the rate of financial return is pivotal for shareholders, as by judging its level and evolution, one can decide upon further investing and supporting the company.

Table 3. Results of the mathematical processing showing the dependence of the financial management performance on the economic profitability ratio

Dependent variable: TE
Independent variable: Economic profitability ratio
Exponential model: Y = exp (a + b*X)
Coefficients

	Least Squares	*Standard*	*T*	
Parameter	*Estimate*	*Error*	*Statistic*	*P-Value*
Intercept	-0.8506	0.0324944	-26.1768	0.0000
Slope	0.623593	0.107828	5.78323	0.0000

NOTE: intercept = ln(a)
Analysis of Variance

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
Model	13.7698	1	13.7698	33.45	0.0000
Residual	304.662	740	0.411705		
Total (Corr.)	318.432	741			

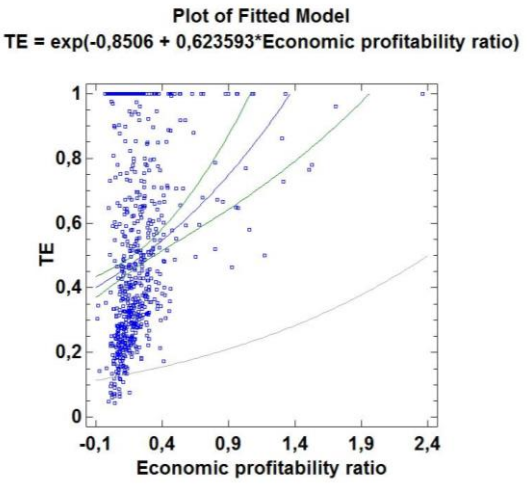
Correlation Coefficient = 0.207948
R-squared = 4.32425 percent
R-squared (adjusted for d.f.) = 4.19496 percent
Standard Error of Est. = 0.641643
Mean absolute error = 0.537343
Durbin-Watson statistic = 2.07738 (P=0.1460)
Lag 1 residual autocorrelation = -0.0408293

Source: Own calculations based on data of NBS.

Financial profitability is basically influenced by the existence of two factors:
-the use of the borrowed capital within the capital structure of the enterprise;
-the deductibility of expenses from interest by introducing them into the enterprise's expenses (as financial expenses) and the existence of the "tax shield" effect.
In addition, it is necessary that the rate of economic return is higher than the cost of the borrowed capital; otherwise the use of borrowed capital becomes inefficient.
Financial profitability ratio can be calculated by reporting the net profit to the size of the proper capital, thus, based on the calculation ratio of this ratio it results that in order to increase its level it is necessary that the net profit increases at a rate higher than the increase in proper capital. Further, the model of the functional relationship between the economic profitability ratio indicator and the TE performance financial management performance assessed by the nonlinear regression method using the STATGRAPHICS Centurion software is presented.

$$TE = e^{-0,8506+0,623593*X6} \quad (2)$$

Microeconomic Analysis of the Economic Efficiency Ratio behavior presented in Figure 3 by evaluating the elasticity coefficient of the TE factor highlights a relatively high increase of the financial management performance along with the increase of the economic efficiency.



cy.

Fig. 3. Graph of dependence between TE and Economic profitability ratio
Source: Own calculations based on data of NBS.

Taking into account data presented in Table 3 and the results of the nonlinear regression, we can mention that the Intercept = -0.8506 and Slope = 0.623 according to the formula (2) for

the average values of the factors X6 = 0.223 and Y = 0.584 the elasticity is e_6=0.116. The validity of the proposed mathematical model is good due to the Fisher criterion significant value F = 33.45 and the correlation coefficient R = 0.207 between the causal factor X6 and the endogenous factor TE shows a strong bond and the precision of the calculation is satisfactory. analysis which allows to make a classification of the evaluated sample by homogenous groups of centroids with similar financial performance characteristics The process of cluster analysis requires to set some limits on the number of economic indicators included and the share of the variables' contribution to financial management performance.

Table 4. Clustering of agricultural enterprises according to the financial management performance

No.	Economic indicators	Profitable and liquid enterprises	Profitable and illiquid enterprises	Unprofitable and liquid enterprises	Unprofitable and illiquid enterprises
	The target cluster	1	2	3	4
1	Number of enterprises in the cluster	213	15	43	471
2	Financial management performance, TE	0.99	0.51	0.55	0.41
3	Employed staff, persons	13	257	138	16
4	Materials, mil MDL	0.22	8.31	3.63	0.40
5	Goods, mil MDL	0.08	5.31	0.15	0.14
6	Circulating assets, mil MDL	2.30	110.43	23.08	3.96
7	Own capital, mil MDL	3.46	89.37	33.63	4.92
8	Long term debts, mil MDL	2.18	45.33	5.79	2.09
9	Current debts, mil MDL	1.25	67.84	8.30	2.49
10	Sales revenue, mil MDL	4.03	169.71	31.88	6.27
11	Gross profit, mil MDL	0.87	31.32	7.35	1.58

Source: Own calculations based on data of NBS.

The significance of this value of the economic performance indicator allows us to conclude that the contribution of this factor is substantial for this financial performance. Thus, the 1% increase in the Economic Efficiency Ratio requires an increase of TE by 0.116%. This assessment allows us to assess the financial importance of each factor included in the mathematical processing model and enables the optimization of financial policies in the agricultural sector. In this way, the non-parametric techniques for assessing financial management performance give the opportunity to define optimal solutions for financial investment in the agricultural sector.

In order to carry out a more thorough analysis of agricultural enterprises in terms of financial management performance it is necessary to perform the grouping of economic enterprises according to criteria of profitability, liquidity, sales revenues and other economic indicators. The definition of the types of agricultural enterprises is achieved by means of a cluster analysis which allows to make a classification of the evaluated sample by homogenous groups of centroids with similar financial performance characteristics The process of cluster analysis requires to set some limits on the number of economic indicators included and the share of the variables' contribution to financial management performance.

Altogether, 742 agricultural enterprises were analyzed by grouping them in accordance with the criteria of financial performance. The specificity of grouping the agricultural enterprises required the use of the Ward method to define the distance between the four clusters identified by the STATGRAPHICS Centurion software.

According to formula 3 the advantage of this approach in choosing the method of agricultural enterprises clustering consists in the use of the "Euclidean metric distance" function to assess the distance between the space points:

$$\text{dist} = \sqrt{\sum_{i=1}^{n}(x_i + y_i)^2} \quad (3)$$

As a result of the mathematical processing of primary data the typology of agricultural enterprises was identified by defining four different types of the economic agent: profitable and liquid enterprises, profitable and illiquid enterprises, unprofitable and liquid enterprises, unprofitable and illiquid enterprises [7].

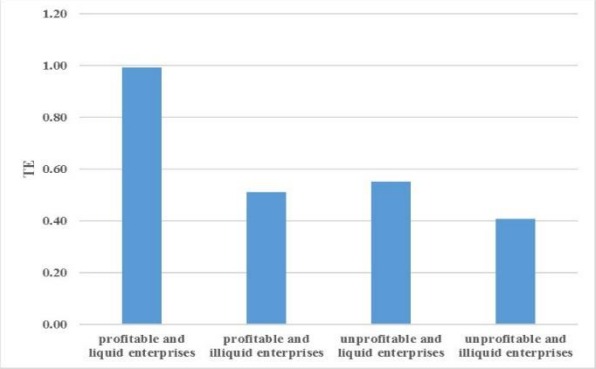


Fig. 4. Classification of agricultural enterprises depending on the financial management performance
Source: Own calculations based on data of NBS.

The characteristics of the economic indicators of each cluster are shown in Table 4. High profitability enterprises that ensure good liquidity of resources are included in the 1st cluster and they represent 63% of the total sample. These agricultural enterprises are not large (on average the staff consists of 13 persons), but the financial management performance records high rates and the TE value of the majority in the cluster is situated on the efficient limit (where TE=1). According to Figure 4, the financial performance management of agricultural enterprises is at maximum for profitable and liquid economic agents.

CONCLUSIONS

Referring to agricultural enterprises activating in the Republic of Moldova, we could mention that the encountering difficulties can affect any aspect of their activity, the cessation of payments being the most serious effect of the low financial performance in their activity. The depreciation of economic and financial indicators, especially profitability and liquidity, push businesses into the so-called hell-spiral of difficulties. The econometric analysis of primary data gives us the possibility to picture the situation of the enterprises in terms of profitability and liquidity, which can define its financial performance by grouping them into four clusters as follows:
(i) profitable and liquid enterprises;
(ii) profitable and illiquid enterprises;
(iii) unprofitable and liquid enterprises;
(iv)unprofitable and illiquid enterprises.
The first class of enterprises has a good viability and their activity requires maintaining the indicators at the same level, which is relatively simple to achieve. Second cluster of enterprises could solve their difficulties by attracting circulating capital from external sources, it is suggested to take long-term credits and loans for which the interest rate is lower and therefore their profitability will not be affected. Similarly, another solution for the latter would be to optimize the cash flows by:

- accelerating cash inflows and, in particular, offering cash payment discounts, advance payment with subsequent delivery of products, reducing the commercial credit period offered to customers, accelerating the collection of receivables with expiration date, refinancing receivables through bills of exchange, the sale of the non-active part of fixed assets, the leasing of unused material assets;
- slowing out cash outflows by increasing the commercial credit term offered by suppliers, converting short-term financial debt into long-term debt, reducing the volume and composition of investment programs, reducing fixed production costs, reducing the capitalization of financial means.

REFERENCES

[1]Boutti, R., 2012, Relationship between corporate social responsibility and financial performance in islamic banking. In: Research journal of finance and accounting. Vol. 3(10), p.93-103.
[2]Cash, D., 2018. Sustainable finance ratings as the latest symptom of 'rating addiction'. In: Journal of Sustainable Finance & Investment. Vol.8(3), p. 242-258.
[3]Mousa, G., 2015, Financial ratios versus data envelopment analysis: the efficiency assessment of banking sector in bahrain bourse. In: International

journal of business and statistical analysis, Vol. 2(2), p. 75-84.
[4]Popescu, A., 2014. Research on milk cost, return and profitability in dairy farming, Scientific papers Series Management, economic engineering in agriculture and rural development. Vol. 14(2), p.223-230.
[5]Șargo, A., Timofti, E., 2015, Financial mechanisms of the development of the agrarian sector in the republic of moldova, Scientific papers series: Management, economic engineering in agriculture and rural development, Vol. 15(2), p.337-340.
[6]Saneia, M., Mamizadeh-Chatghayeh, S., 2013, Performance evaluation of SCM using DEA: A review. In: International journal data envelopment analysis. Vol. 1(1), p.25-32.
[7]Shah, A., Wu, D., Korotkov, V., 2019, Are Sustainable Banks Efficient and Productive? A Data Envelopment Analysis and the Malmquist Productivity Index Analysis, In: Sustainability, Vol. 11(8), p.2-19.
[8]Yang, X., Dimitrov, S., 2017, Data envelopment analysis may obfuscate corporate financial data: Using support vector machine and data envelopment analysis to predict corporate failure for nonmanufacturing firms. In: Information Systems and Operational Research, Vol. 55(4), p. 295–311.